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NORTH AMERICAN FAUNA

No. 43

[Actual date of publication, September 23, 1918]

THE RICE RATS OF NORTH AMERICA

(Genus ORYZOMYS)

BY

EDWARD A. GOLDMAN
ASSISTANT BIOLOGIST, BIOLOGICAL SURVEY

WASHINGTON
GOVERNMENT PRINTING OFFICE
1918

43

NORTH AMERICAN FAUNAS.

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(Continued on page 3 of cover.)

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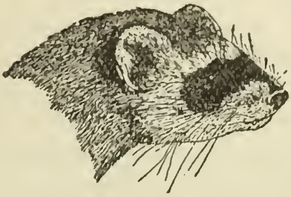

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EDWARD A. GOLDMAN
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WASHINGTON
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1918

LETTER OF TRANSMITTAL.

United States Department of Agriculture,
Bureau of Biological Survey,
Washington, D. C., April 26, 1917.

Sir: I have the honor to transmit for publication as North American Fauna No. 43 the results of a study of North American forms of the rice rats (genus *Oryzomys*), by Edward A. Goldman, assistant biologist of this bureau. This constitutes a revision of this group, based chiefly upon material in the collection of the Biological Survey. Rice rats are distributed from the latitude of Maryland and Delaware south through parts of the Southeastern States, Mexico, and Central America to South America, where they reach their highest development. While not so injurious to agriculture as some other rodents, they consume in the aggregate large quantities of forage when, like cottonrats and meadow mice, they increase locally to excessive numbers. A knowledge of their distribution, as presented in this report and its accompanying maps, will aid in studies made to control the depredations of rice rats. Owing to their nocturnal habits the animals are little known, and their economic relations should be better understood.

Respectfully,

E. W. Nelson,
Chief, Biological Survey.

Hon. D. F. Houston,
Secretary of Agriculture.

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No. 43. NORTH AMERICAN FAUNA. Sept. 23, 1918.

THE RICE RATS OF NORTH AMERICA.

(Genus Oryzomys.)

By Edward A. Goldman.

INTRODUCTION.

The rice rats of the genus *Oryzomys* belong to the murine subfamily Cricetinæ, which includes also a number of closely allied generic groups of American rodents, as the vesper rats (*Nyctomys*), deer mice (*Peromyscus*), grasshopper mice (*Onychomys*), and others. By reason of their small size and nocturnal habits all these rodents largely escape observation, and the economic importance resulting from their excessive numbers and wide distribution is not generally realized. The vernacular name "rice meadow-mouse," bestowed on *Oryzomys palustris* by Bachman, because originally it was found in the rice fields of South Carolina and Georgia, has led to the appellation "rice rat" commonly applied to all species of the genus, although many inhabit regions where rice is not cultivated.

Owing to similarity in ratlike form and general appearance, most of the genera with which *Oryzomys* is allied, including species with widely differing habits, are scarcely recognizable by external characters alone, and reliance must be placed on distinguishing features exhibited by skulls and teeth. The genus *Oryzomys* comprises a somewhat composite assemblage of species presenting considerable diversity in general characters, but having the essential dental arrangement repeated with remarkable fidelity throughout the series.

The general range of the genus is from New Jersey and the central part of the Mississippi Valley southward, the group being represented in nearly every part of South America and apparently reaching its greatest development there. More than 150 species and subspecies have been described, of which number, however, some have been segregated in the erection of closely allied genera, and others are doubtfully allocated. Many regions remain unexplored and the number of forms assignable to *Oryzomys* as now restricted will probably far outnumber those of any other genus of American rodents. In the present revision are treated the North American continental species as far as the eastern border of Panama, and those of outlying islands. Fifty-one forms of 21 species are recognized, two of which are characterized for the first time. These are comprised in the three subgenera *Oryzomys*, *Oligoryzomys*, and *Melanomys*.

HABITS AND ECONOMIC RELATIONS.

The habits of all the rice rats are somewhat similar, but differ in details in conformity with varying environmental conditions. In general, a preference is shown for meadows or marshy areas, commonly in the vicinity of water at rather low elevations; but some species have ascended, especially along the courses of streams, to high altitudes; others, departing farther from the semiaquatic environment, have entered the forest and become partially scansorial. They are nocturnal and, like many other small rodents, thus escape ordinary observation, most species coming out and wandering here and there through marsh, meadow, and herbaceous or even shrubby vegetation. Fairly well-worn runways are sometimes made along the edges of water or form general routes through dense vegetation, but these are not so well defined as those of the cotton rats (*Sigmodon*), which often share the same local habitat. The more aquatic species readily enter the water and swim and dive freely.

The nests, made of plant fibers of many kinds, are placed in shallow burrows or sheltered places, commonly under massed vegetation on or near the ground, but the site chosen may be in a tangled clump of flags or marsh grasses standing in the water. From 3 to 7 young are produced at a birth, 4 or 5 being the usual number. In *Oryzomys palustris* many young are brought forth in the months of April and May, but in this and other species their appearance at all seasons is ample evidence that there is no definite breeding season, except possibly near the extreme northern limit of the group.

The rice rats feed extensively on green or succulent plants, food habits shared with the cottonrats (*Sigmodon*) and meadow mice (*Microtus*). In early morning many freshly cut grass stems in the meadows evidence their nocturnal activity in favored places. While green food forms the normal ration of most species, drier foods, as seeds, also are eaten to some extent, and as with some other small rodents meat is relished at times. Specimens may be taken in meat-baited traps, and individuals thus caught are sometimes devoured by their own kind. Bachman,[1] who studied the habits of *Oryzomys palustris*, records that those kept in captivity "fed on grains of various kinds, but always gave the preference to small pieces of meat." In their natural habitat he observed them scratching up the recently planted rice. He found that they begin feeding on rice when it is in the milky state and continue gathering the scattered grains in the fields during autumn and winter. He also observed them feeding on the large seeds of the gama grass (*Tripsacum dactyloides*), on those of the wild rye (*Elymus virginicus*), and at certain seasons on those of the marsh grass (*Spartina glabra*). Bachman further states that the rice rat "sometimes retires to the shore for food, but has no disrelish to the small crustacea and mollusks that remain on the mud at the subsiding of the tide."

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[1] Audubon, J. J., and Bachman, John, Quadr. North Amer., III, p. 215, 1854.

Species inhabiting forested areas usually become very abundant in clearings where a ground cover is allowed to grow. Rice rats apparently are not so injurious to crops as some other rodents, but like the cotton rats and meadow mice increase locally to excessive numbers and then consume, in the aggregate, very large quantities of forage. Methods of poisoning that have proved effective in checking the ravages of meadow mice could probably be utilized with similar success in the control of rice rats. Owing to their nocturnal habits these mice are preyed upon by owls and doubtless by many carnivorous mammals. The rice rats and allied members of the great murine family to which they belong are the most numerous of American mammals, and their economic relations should be better known.

GENERAL CHARACTERS.

The rice rats as a whole present a wide range of variation in external appearance. Some of the larger, more robust species, including *Oryzomys palustris*, have not infrequently been mistaken for Old World rats of the genus *Rattus*, which have followed civilized man in his migrations and now not only universally infest his structures, but in favorable districts invade the fields in close competition with native rodents. Superficial resemblances are often striking, the bodily proportions and color and texture of pelage being very similar. On the other hand, many species are widely different from the Old World rats, in rich tawny coloration or character of pelage, and are more likely to be confused with allied American murine genera. The smallest North American species (subgenus *Oligoryzomys*) simulate in color, delicate structure, and great length of tail some of the harvest mice (*Reithrodontomys*); another group (subgenus *Melanomys*) is more robust, the tail very short, and general proportions *Akodon*-like.

In *Oryzomys* and allied genera superficial resemblances frequently mask the more essential features, and external characters, especially size and color, are less dependable than cranial modifications in tracing relationships of species. The group alignment, however, is often indicated by proportions of body and limbs; color and length of general pelage; length of vibrissæ; hairiness of ears, feet, and tail;

presence or absence of prominent tufts of digital bristles; and form of claws. Aside from the general form and angularity of the skull, the principal characters of taxonomic value are the following: Size and form of incisors and molars; depth and arrangement of reentrant angles, form and position of enamel islands, and development of cusps in molar crowns; length and form of anterior palatine foramina; length of palatal bridge; position of lachrymals; form of maxillæ, premaxillæ, frontals, parietals, and interparietal; and size and form of audital bullæ.

PELAGE.

The pelage is rather harsh in texture throughout the genus, but varies greatly in length in the component groups. The overfur is longer, the vibrissæ shorter, and the underfur denser and more woolly in semiaquatic species. Groups in which the pelage is normally short tend to develop longer fur in the forms which range at high altitudes; but several species, some with pelage much longer than others, may occur together at the same elevations. The ears are rather small and in typical *Oryzomys* and various groups, including the subgenus *Oligoryzomys*, the hairy covering is moderately long, coarse, and not sharply differentiated from the body fur; in the *O. talamancæ* and other groups the ears are minutely pilose, in marked contrast with the general pelage. The claws on the toes of the hind feet in the semiaquatic or more strictly terrestrial species are relatively long and straight, broad, and obtuse, and only partially overlapped by the digital bristles, while in the less aquatic or scansorial species they are short and recurved, compressed and sharp pointed, and prominent digital tufts project beyond the ends. In *O. palustris* the vibrissæ scarcely reach from the muzzle to the ears; in *O. pirrensis* and *O. bombycinus* they extend over the shoulders, while in various species they are intermediate in length.

COLOR.

In coloration of upperparts the range of variation in the rice rats is from pale shades of buff or gray to rich tawny or russet, more or less mixed with black, especially over the median part of the dorsum. The underparts usually are dull white or buff, without a sharp line of demarcation along the sides, the plumbeous basal color showing through (a few species exhibiting basally white areas). The tail is not very sharply bicolor, but usually is brown above and lighter below, at least basally, the epidermis and scanty investing hairs of about the same tone.

MOLT.

As breeding begins during adolescence and is continuous throughout the year, and as individuals arrive at maturity at all seasons, there is no very definite period for molting, although the more northerly forms tend in winter to acquire a longer pelage, which becomes abraded in summer. As a rule the new coat seems to replace the old almost imperceptibly, but adults in apparently fresh and in obviously worn pelages may often be seen together.

AGE.

The age of individuals is indicated approximately by the degree of wear on the molar crowns. The shearing of the slopes, beginning early in life, becomes distinctly noticeable as full growth is attained, and, progressing rapidly across the summits of the tubercles, in advanced age results in the obliteration of all trace of enamel arrangement.

VARIATION.

Variation in the rice rats is assignable to several categories, of which perhaps the most obvious are individual and geographic.

INDIVIDUAL VARIATION.

By individual variation is meant all the degrees of divergence from a typical mean exhibited by large series of conspecific skins and skulls from any given locality. The range of this variation, especially in general size, is extraordinary; in many species of corresponding age and sex it exceeds 10 per cent both in external and cranial dimensions. The typical mean, therefore, may be difficult to determine when a small series of examples exhibits preponderance toward either of the extremes; and conclusions based on the dimensions of a small number of individuals are likely to be misleading. While males average slightly larger than females, sexual differences in size appear to be negligible. Cranial variations in proportions and in the form of individual bones are noticeable, but usually within rather circumscribed limits. Some skulls are decidedly broader and more massive than others of the same age and sex. Thickness of rostrum is usually, but not always, associated with breadth of frontal region and braincase. General expansion of the braincase commonly results in increased breadth across the posterior part of the frontals. The interparietal is variable in form, as are the parietals in the extent of encroachment of the lateral wings on the squamosals. The size of the molar teeth and of the audital bullæ is fairly constant.

Individual variation in color is much less than in size. Much of the variation in color observable is due to age or condition of pelage. The older adults tend at all seasons to exhibit more rufescent tones than the younger. A rusty reddish appearance is often due to much-worn pelage. There are no distinct color phases.

GEOGRAPHIC VARIATION.

Geographic variation, or the tendency of species to subdivide into regional or more or less localized forms, is very great in the genus *Oryzomys*. Of the numerous forms first described as distinct species a considerable number prove when better known to be geographic representatives of widely ranging specific types, presenting differential characters associated in part with environmental conditions. The intergradation and subspecific position of many such forms can be demonstrated beyond any reasonable doubt in some instances, and in others may be safely assumed, in the light of knowledge of the essential characters of the particular group. Since the distribution of the rice rats is mainly at low elevations, it is not surprising to find that species maintaining the same characters over extensive areas near sea level, where nearly uniform topographic and climatic conditions prevail, become locally modified on ascending to high altitudes. Thus, *O. couesi* and *O. alfaroi* are represented by widely ranging coastal forms and by more localized high-mountain races. That forms inhabiting mainly open, arid regions are paler than those inhabiting humid or heavily forested areas is well illustrated by the distribution of the races of *O. couesi* in Mexico. The dark typical form occupies the relatively humid area near the Gulf of Mexico and the Caribbean Sea, while the pale subspecies, *O. c. mexicanus*, pushes far northward along the arid Pacific coast, the point of divergence being near the Isthmus of Tehuantepec. Species reaching high altitudes tend to develop structural as well as color differences, while varying climatic conditions at low elevations are apt to result mainly in color modifications. Insular species are usually related to those inhabiting the adjacent mainland, but may exhibit very distinctive characters, unless the islands are very near the coast.

HISTORY AND MATERIAL.

A species of *Oryzomys* was first described under the name *Mus palustris* from New Jersey, by Richard Harlan,[1] in 1837. He compared the animal with the Norway rat, and owing to superficial resemblances regarded it as congeneric with the rats of the Old World. It was erroneously referred to the genus *Arvicola* in 1854 by Bachman,[2] who mentions having obtained specimens as early as the winter of 1816. According to Bachman, these specimens were described by him (but the description not published) in May, 1836. One was sent to the Academy of Natural Sciences of Philadelphia for comparison with material there, and on the basis of this and an example in the Academy collection Dr. Harlan felt authorized to publish his *Mus palustris*.

---

[1] Silliman's Amer. Journ. Sci., XXXI, p. 385, 1837.

[2] Audubon, J. J., and Bachman, John, Quadr. North Amer., III, p. 214, 1854.

In renaming the species *Arvicola oryzivora*, Bachman assumed that *Mus palustris* Harlan was preoccupied by *Arvicola palustris* Harlan,[1] an obvious error, as the two were not congeneric.

In 1857 Baird,[2] recognizing distinctive characters, used *Oryzomys* as a full generic name for the group, with *Mus palustris* Harlan as type, apparently inadvertently, however, as on a later page of his publication[3] he accorded it only subgeneric value under *Hesperomys* of Waterhouse. In this course he was followed by Coues in 1877.[4] Thirteen years later the same author[5] raised the name to generic rank. Meanwhile *Hesperomys fulvescens* Saussure[6] and *Hesperomys couesi* Alston[7] had been described, but their real generic position was not determined until later. New species were added at intervals, but of the relationships of the North American members of the genus little was known until 1901, when, as a result of study mainly of material which had accumulated in the collection of the Biological Survey, Merriam[8] published a synopsis of the forms inhabiting the United States and Mexico. Thirty-five species and subspecies were recognized by him, of which 20 were new. The species were divided into natural groups for the first time, and their salient characters pointed out. Short papers, largely descriptive of new species, by Thomas,[9] Allen,[10] Bangs,[11] Elliott,[12] and Goldman,[13] have since appeared. The larger collections now available render it possible to determine the status of nearly all names, and the relationship, especially of the more austral species, to South American forms.

The present revision is the result of a study of the rice rats in the Biological Survey, the Merriam, and other collections in the United States National Museum, now numbering 1,050 specimens, augmented by 563 from other American museums,[14] the assemblage including the types or topotypes of most of the species. The location of specimens examined in collections other than those in the United States National Museum is indicated by footnotes.

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[1] Harlan, Richard, Fauna Americana, p. 136, 1825.

[2] Baird, S. F., Mamm. North Amer., p. 459, 1857.

[3] Op. cit., p. 482.

[4] Coues, Elliott, Monogr. North Amer. Rodentia, p. 113, 1877.

[5] Coues, Elliott, Century Dict., IV, p. 4165, 1890.

[6] Saussure, H. de, Rev. et Mag. de Zool., ser. 2, XII, p. 102, March, 1860.

[7] Alston, E. R., Proc. Zool. Soc., London, p. 756, 1876.

[8] Merriam, C. Hart., Proc. Washington Acad. Sci., III, pp. 273-295, July 26, 1901.

[9] Thomas, O., Ann. Mag. Nat. Hist., ser. 7, VIII, pp. 251-253, Sept., 1901.

[10] Allen, J. A., Bull. Amer. Mus. Nat. Hist., XXIV, pp. 654-657, Oct. 13, 1908 (including *Oryzomys ochraceus* [=*Nectomys alfari*], see Goldman, Proc. Biol. Soc., Washington, XXIX, p. 127, June 6, 1916); ibid., XXXIII, pp. 99-100, Apr. 30, 1910; ibid., XXXII, pp. 533-554, Nov. 17, 1913.

[11] Bangs, O., Bull. Mus. Comp. Zool., XXXIX, pp. 33-36, Apr. 1902.

[12] Elliott, D. G., Field Columb. Mus. publ. 71, Zool. ser. III, p. 145, Feb., 1903; ibid., III, pp. 266-267, Mar. 1904.

[13] Goldman, E. A., Smiths. Misc. Coll., LVI, no. 36, pp. 5-8, Feb. 19, 1912; ibid., LX., no. 22, pp. 5-6, Feb. 28, 1913; Proc. Biol. Soc. Washington, XXVIII, pp. 127-130, June 29, 1915.

[14] For the use of material generously loaned and for other courtesies the author's thanks are due to Dr. J. A. Allen, American Museum of Natural History; to Mr. Samuel Henshaw and Mr. Outram Bangs, Museum of Comparative Zoology; to Mr. W. H. Osgood, Field Museum of Natural History; to Mr. Witmer Stone, Academy of Natural Sciences of Philadelphia; to Mr. W. E. Clyde Todd and Mr. O. P. Murie, Carnegie Museum; and to Mr. C. D. Bunker, Kansas University Museum. In addition he is indebted to Mr. Oldfield Thomas for critical notes and comparisons of specimens with types in the British Museum.

EXPLANATIONS.

MEASUREMENTS.

All measurements of specimens are in millimeters. With a few exceptions, usually stated, the external measurements were taken in the flesh by the collector, as follows: *Total length*, nose to end of terminal tail vertebra; *tail vertebræ*, upper base of tail to end of terminal tail vertebra; *hind foot*, heel to end of longest claw. While adult males average slightly larger than females, the difference is scarcely appreciable and in the small series usually available may be ignored. The external and cranial measurements given, therefore, are of series which may include specimens of both sexes. Of many species and subspecies so few nearly typical examples are available that the measurements given may not represent the normal range of individual variation, and too broad generalizations, therefore, should not be based upon them. The following cranial measurements were taken with a vernier caliper by the author:

Greatest length.—Length from tip of nasals to supraoccipital in median line over foramen magnum.

Zygomatic breadth.—Greatest distance across zygomata.

Interorbital breadth.—Least distance between orbits.

Width of braincase.—Distance between outer sides of squamosals at the slight constriction over auditory meatus and immediately in front of lateral occipital crests.

Nasals.—Greatest length of nasals.

Anterior palatine foramina.—Greatest length of large palatal foramina.

Palatal bridge.—Distance from excavated posterior border of palate to posterior end of either large palatal foramen.

Upper molar series.—Greatest length of maxillary toothrow at alveolar border.

COLORS.

The names of colors used in descriptions are mainly those of Ridgway.[1] A few other modifying or comparative terms, however, have been employed, usually when some special difficulty was encountered in naming an indefinite hue or tone.

TEETH.

The nomenclature of the principal tooth elements used in the text is given in figure 1.[2]

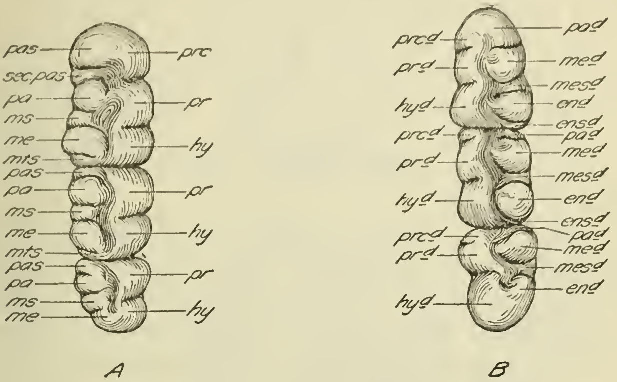
---

[1] Ridgway, Robert, Color Standards and Color Nomenclature, 1912.

[2] For the homology and nomenclature of the molar crown divisions the writer is indebted to Messrs. Gerrit S. Miller, jr., and James W. Gidley, whose extensive researches, still in progress, in the phylogeny of the rodents, enable them to render an authoritative opinion.

ZONAL DIVISIONS.

Aside from the well-known extratropical North American zonal divisions, all references in the text under "Geographic distribution" are to less well-known tropical divisions, the Lower and Upper Tropical Zones, which may be roughly defined as follows: The Lower Tropical Zone, extending in tropical Middle America from sea level to elevations varying mainly in accordance with latitude and local topographic conditions. South of the twentieth parallel this zone reaches to about 3,000 or 3,500 feet altitude. Above these limits it is replaced by the Upper Tropical Zone, which extends to about 7,000 or 8,000 feet. Each of these zones is readily separable into subdivisions on the basis of moisture, and are denominated, respectively, the Humid and Arid Lower Tropical and the Humid and Arid Upper Tropical Zones.



pas	Parastyle.	*prc*	Protoconule.	prc^d	Protoconulid.	pa^d	Paraconid.
sec. pas	Secondary parastyle.	*pr*	Protocone.	pr^d	Protoconid.	me^d	Metaconid.
pa	Paracone.	*hy*	Hypocone.	hy^d	Hypoconid.	mes^d	Mesostylid.
ms	Mesostyle.					en^d	Entoconid.
me	Metacone.					ens^d	Entostylid.
mts	Metastyle.						

FIG. 1.—Molar teeth of typical *Oryzomys* with outlines accentuated to show principal crown elements. A, Right upper molars; B, left lower molars.

GENUS ORYZOMYS Baird.

Oryzomys Baird, Mamm. North Amer., pp. xlii, 458, 482, 1857 (subgenus of *Hesperomys* Waterhouse). Type *Mus palustris* Harlan.

Oryzomys Coues, Century Dict., IV, p. 4164, 1890.

Oligoryzomys Bangs, Proc. New England Zool. Club, I, p. 94, Feb. 23, 1900 (subgenus). Type *Oryzomys navus* Bangs.

Melanomys Thomas, Ann. Mag. Nat. Hist., ser. 7, X, p. 248, Sept. 1902 (subgenus). Type *Oryzomys phæopus* Thomas.

Melanomys Allen, Bull. Amer. Mus. Nat. Hist., XXXII, p. 533, Nov. 17, 1913 (genus).

Geographic distribution.—Eastern and central United States from New Jersey, Kentucky, Illinois, Kansas, and Texas across Mexico to Lower California and south through South America to Cape Horn.

Generic characters.—Form murine; pelage slightly hispid, but not bristly or spiny; tail usually long, but varying from about three-fourths length of head and body to one-fourth longer, the annulated scales distinctly visible through short, sparse investing hairs; ears varying from small to rather large, and finely to coarsely haired; soles of hind feet naked to heels, normally 6-tuberculate; mammæ 8: pectoral, 2–2; inguinal, 2–2.

Skull relatively thin and smoothly rounded; supraorbital and temporal ridges prominent or obsolescent; interparietal variable in size and contour; zygomata slender, depressed to near level of molars; antorbital foramen subcylindrical above, more or less abruptly constricted to a narrow slitlike opening below; outer wall of antorbital foramen rather broad, but varying in extent of anterior projection, the upper border rounded or slightly angular; palate reaching posteriorly beyond plane of last molars, the interpterygoid border concave or presenting a slight median projection; palatal pits present; audital bullæ rather slightly inflated, tapering anteriorly and oblique in position.

Molar crowns low (slightly higher in *Melanomys* than in the other subgenera) with prominent cusps, cones, or tubercles, and well-developed styles, the principal cusps arranged nearly opposite in two longitudinal series; upper molars 3-rooted; lower molars 2-rooted. First upper molar with parastyle and paraconule strongly developed, partially divided near middle, and extended across internally for a distance equal to three-fourths or more of the greatest transverse diameter of tooth; secondary parastyle usually prominent; mesostyles and metastyles in all the upper molars present as small cusps or represented by enamel ridges connecting with principal inner cusps; inner cusps of first and second upper molars with oblique commissures; third upper molar with posterior portions more or less obsolete, the hypocone varying in development and the metacone usually indicated only by a low abbreviated enamel fold. Lower molar cusp-arrangement similar to upper, but paraconid and paraconulid in anterior tooth faintly or not at all notched longitudinally; protoconids and hypoconids in first and second molars with oblique commissures as in the homologous elements in upper teeth; mesostylids and entostylids joined by transverse enamel ridges with outer principal cusps; second lower molar with a moderately developed protoconulid; third lower molar with entoconid and entostylid completely fused or obsolescent. Front of upper incisors without grooves.

Remarks.—When the molars of *Oryzomys* are opposed the cusps in the upper jaw enter behind the corresponding cusps in the lower jaw. The parastyle is overlapped by the paraconid, the trenchant anterior border of which shears on its anterior surface. The paraconule of the anterior molar and the protocones and hypocones of the other molars are broadly beveled or sheared internally, as are the protoconids and hypoconids. The paracones and metacones, on the other hand, are at first sheared posteriorly, while the metaconids and entoconids are sheared anteriorly, but progressive wear extending across the summits tends to level the entire series uniformly.

The genus presents complex relationships to various murine genera. Among its nearer relatives is *Nectomys*, which the more typical forms much resemble in external appearance as well as in the general form of the cranium. In dentition the two genera are also similar, but in typical *Oryzomys*, while the molar crowns as a whole are decidedly lower, .the cusps or cones are higher, more conical, with summits more fully covered with enamel. In *Nectomys*, on the other hand, the low cusps tend to fuse with the styles and dentine is exposed at an earlier age. *Oryzomys* differs from *Nectomys* in other dental details, especially the development of the paraconulid of the second lower molar. The subgenus *Melanomys*, however, exhibits a somewhat intermediate condition; the molar crowns as a whole are somewhat higher than in typical *Oryzomys*, and lower than in *Nectomys;* the cones are high as in *Oryzomys*, but in sculpture, especially the early exposure of dentine, approach those of *Nectomys*. Another character suggesting gradation of *Melanomys* toward *Nectomys* is the position of the lachrymal, its attachment being mainly with the maxilla as in that genus, instead of about equally with maxilla and frontal as in typical *Oryzomys*. Agreement with *Oryzomys* is shown in the more essential dental details, including the marked development of the paraconulid in the second lower molar, an element absent in *Nectomys*.

Comparison with various other genera reveals obvious resemblances and points of difference in varying combination. *Oryzomys* agrees closely with *Neacomys* in cranial and dental characters, but the latter genus exhibits a departure in its grooved and bristly or spiny pelage. The generic name *Nesoryzomys* based on rice rats inhabiting the Galapagos Islands does not seem well founded, as the palate and dentition are *Oryzomys*-like and in the short tail and reduced interorbital space, alleged generic characters, it is not widely different from some of the continental species of *Oryzomys*.

In dentition *Oryzomys* is similar to *Rhipidomys*, but the molar cusps are more crowded and the parastyle and protoconule are less distinctly separated by a median notch. The posterior part of the palate, however, presents features at variance in the two genera. Unlike that of *Oryzomys* the palate in *Rhipidomys* is excavated between the posterior molars, and the palatal pits are separated by the interpterygoid fossa. The genus *Nyctomys* is allied to *Rhipidomys*, but exhibits a wider departure from *Oryzomys*. The molar crown arrangement is similar in all three genera, but in *Nyctomys* the cusps are more angular, the styles and commissures less developed, and the enamel covering maintained until later in life than in the others. In the posterior excavation of the palate *Nyctomys* more nearly resembles *Rhipidomys;* but, in the remarkable lateral development of the interparietal to a broad line of contact with the squamosals and consequent isolation of supraoccipital and parietals, *Nyctomys* differs notably from both *Rhipidomys* and *Oryzomys*.

Some sections of the large genus *Peromyscus* are not very widely different from *Oryzomys* in dentition, but the principal cusps are obliquely placed, the protoconule much more developed, and the paracone and metacone shear mainly internally instead of posteriorly as in *Oryzomys*. The general form of the skull in *Peromyscus* is distinctive; the palate ends near the posterior plane of the molars and the palatal pits present in *Oryzomys* are absent.

In external appearance the genus *Reithrodontomys* bears a remarkable resemblance to the oryzomine subgenus *Oligoryzomys;* and in the *Aporodon* section of *Reithrodontomys*, in which the styles are present, an approach in molar pattern is manifested; but in *Reithrodontomys* generic distinction is lodged in the grooved upper incisors. The genus *Zygodontomys*, until recently associated with *Oryzomys*, is similar in outward appearance and in general form of skull, but in height of molar crowns, absence of style ridges, and longitudinal instead of oblique commissures of cusps it departs widely from *Oryzomys* and more nearly approaches *Akodon*.

SUBGENERA AND MINOR GROUPS.

Of the three subgenera into which the North American species of the genus *Oryzomys* are here divided, *Oligoryzomys* and *Melanomys* each contain a single group of closely related forms, while the subgenus *Oryzomys* is divisible into seven rather well-defined minor groups, or assemblages, of species or subspecies (excluding *O. victus*, whose exact relationships are unknown). These assemblages are usually distinguishable by external characters, but recourse to cranial structure is sometimes necessary in order to make accurate determinations.

(1) The *O. palustris* group is characterized by large, robust form, small, coarsely haired ears, short vibrissæ, and the absence of conspicuous tufts of silvery bristles, which in all the other groups project beyond the ends of the longer claws on the hind feet. The skull is broad with short rostrum, very long anterior palatine foramina (normally reaching anterior plane of first molars), and large audital

bullæ. The principal reentrant angles normally reach less than halfway across the molar crowns. In the moderately worn crown of the second upper molar a crescentic central enamel island extends along the postero-internal base of the paracone.

(2) The *O. melanotis* group comprises slender, medium-sized, rich ochraceous-buffy or ochraceous-tawny species with large ears clothed externally with short, fine dusky hairs and internally with similarly short, fine rufescent hairs. The skull is narrow with elongated rostrum, short anterior palatine foramina, and small audital bullæ. The dentition departs slightly from the *O. palustris* type; the enamel arrangement is very similar but the reëntrant angles extend farther across the molar crowns.

(3) The *O. alfaroi* group includes small, dark-colored forms with short pelage, comparatively large, conspicuous ears clothed externally and internally with short, fine blackish hairs. The skull is small and delicate in structure. The dentition is similar to that of the *O. melanotis* group.

(4) The *O. talamancæ* group bears much superficial resemblance to the *O. alfaroi* group, but the members are usually brighter, more tawny in color. More distinctive characters are exhibited by the skull and teeth, especially the molar crown arrangement. In the grinding surface of the second upper molar the dentine ridge connecting paracone and protocone, owing to more posterior position, eliminates the large central enamel island present in the *O. alfaroi* group, and the crown of the third lower molar is much more than half cleft by the outer reentrant angle (about half cleft in the *O. alfaroi* group).

(5) The *O. bombycinus* group is easily recognized by very long pelage, that of the back measuring about 12 millimeters. The supraorbital vibrissæ reach the remarkable length of 50 to 70 millimeters. The dentition is about as in the *O. talamancæ* group.

(6) The *O. devius* group is distinguished by very large but rather slender form, relatively long tail (much longer than head and body), and dark general coloration. The dentition is similar to that of the *O. talamancæ* and *O. bombycinus* groups.

(7) The *O. tectus* group may be known by large size, rich tawny coloration, small ears clothed with rather coarse hairs of general body color, and short, stout hind feet. The skull is broad, with short rostrum and prominently projecting supraorbital ridges. The dentition is much as in the *O. talamancæ* group.

In the present revision 44 species and subspecies are assigned to the typical subgenus *Oryzomys*, 5 forms are placed in the subgenus *Oligoryzomys*, and 2 in the subgenus *Melanomys*.

List of North American Species and Subspecies, with Type Localities.

Subgenus ORYZOMYS.

Oryzomys palustris group:	
Oryzomys palustris palustris (Harlan)	"Fastland," near Salem, New Jersey.
palustris natator Chapman	Gainesville, Florida.
palustris coloratus Bangs	Cape Sable, Florida.
palustris texensis Allen	Rockport, Texas.
couesi couesi (Alston)	Coban, Guatemala.
couesi richmondi Merriam	Escondido River, Nicaragua.
couesi zygomaticus Merriam	Nenton, Guatemala.
couesi mexicanus Allen	Hacienda San Marcos, Jalisco, Mexico.
couesi aztecus Merriam	Yautepec, Morelos, Mexico.
couesi crinitus Merriam	Tlalpam, Federal District, Mexico.
couesi regillus Goldman	Los Reyes, Michoacan, Mexico.
couesi albiventer Merriam	Ameca, Jalisco, Mexico.
couesi peragrus Merriam	Rio Verde, San Luis Potosi, Mexico.
couesi aquaticus Allen	Brownsville, Texas.
fulgens Thomas	"Mexico."
gatunensis Goldman	Gatun, Canal Zone, Panama.
cozumelæ Merriam	Cozumel Island, Mexico.
antillarum Thomas	Jamaica.
peninsulæ Thomas	Santa Anita, Lower California, Mexico.
nelsoni Merriam	Maria Madre Island, Mexico.
Oryzomys melanotis group:	
Oryzomys melanotis melanotis Thomas	Mineral San Sebastian, Jalisco, Mexico.
melanotis colimensis, nobis	Armeria, Colima, Mexico.
rostratus rostratus Merriam	Metlaltoyuca, Puebla, Mexico.
rostratus megadon Merriam	Teapa, Tabasco, Mexico.
rostratus yucatanensis Merriam	Chichen Itza, Yucatan, Mexico.
Oryzomys alfaroi group:	
Oryzomys alfaroi alfaroi (Allen)	San Carlos, Costa Rica.
alfaroi dariensis Goldman	Cana, Panama.
alfaroi angusticeps Merriam	Volcan Santa Maria, Guatemala.
alfaroi rhabdops Merriam	Calel, Guatemala.
alfaroi caudatus Merriam	Comaltepec, Oaxaca, Mexico.
alfaroi palatinus Merriam	Teapa, Tabasco, Mexico.
alfaroi saturatior Merriam	Tumbala, Chiapas, Mexico.
alfaroi chapmani Thomas	Jalapa, Vera Cruz, Mexico.
alfaroi dilutior Merriam	Huauchinango, Puebla, Mexico.
guerrerensis Goldman	Omilteme, Guerrero, Mexico.
hylocetes Merriam	Chicharras, Chiapas, Mexico.
Oryzomys talamancæ group:	
Oryzomys talamancæ Allen	Talamanca, Costa Rica.
Oryzomys bombycinus group:	
Oryzomys bombycinus bombycinus Goldman	Cerro Azul, Panama.
bombycinus alleni Goldman	Tuis, Costa Rica.
Oryzomys devius group:	
Oryzomys devius Bangs	Boquete, Panama.
pirrensis Goldman	Mount Pirre, Panama.
Oryzomys tectus group:	
Oryzomys tectus tectus Thomas	Bugaba, Panama.
tectus frontalis Goldman	Corozal, Canal Zone, Panama.
Oryzomys victus[1] Thomas	St. Vincent, Lesser Antilles.

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[1] Not examined and group association not determined.

Subgenus OLIGORYZOMYS.

Oryzomys fulvescens fulvescens (Saussure)	Orizaba, Vera Cruz, Mexico.
fulvescens lenis Goldman	Los Reyes, Michoacan, Mexico.
fulvescens mayensis, nobis	Apazote, Campeche, Mexico.
fulvescens costaricensis Allen	El General, Costa Rica.
fulvescens vegetus Bangs	Boquete, Panama.

Subgenus MELANOMYS.

Oryzomys caliginosus idoneus Goldman	Cerro Azul, Panama.
caliginosus chrysomelas Allen	Suerre, Costa Rica.

Key to Subgenera.

a^1. Lachrymal articulating about equally with frontal and maxilla anteriorly; tail about equal to or longer than head and body.
  b^1. Second upper molar with central enamel island normally elongated or absent; supraorbital and temporal ridges present; hind foot usually more than 25 .... **Oryzomys** (p. 17).
  b^2. Second upper molar with central enamel island normally circular; supraorbital and temporal ridges absent; hind foot usually less than 25. **Oligoryzomys** (p. 87).
a^2. Lachrymal articulating almost entirely with maxilla anteriorly; tail about three-fourths length of head and body .... **Melanomys** (p. 94).

Subgenus ORYZOMYS Baird.

Subgeneric characters.—Color of upperparts usually contrasting strongly with that of underparts;[1] feet (epidermis and hairs), including toes, whitish, yellowish, or brownish;[1] tail about equal to or longer than head and body;[1] anterior border of lachrymal articulating about equally with maxilla and frontal;[1] supraorbital and temporal ridges usually prominent;[2] secondary parastyle well developed;[1] slightly worn crown of second upper molar with central enamel island elongated or absent;[2] upper incisors decidedly curved backward near points.[1]

Key to Species of the Subgenus Oryzomys.

[Typical adults.]

a^1. Habitat North America and Greater Antilles.
  b^1. Hind foot without prominent tufts of digital bristles projecting beyond ends of three median claws.
    c^1. Habitat Rio Grande Valley south to Panama, and including islands near coasts of Mexico and West Indies.
      d^1. Habitat continental.
        e^1. Supraorbital ridges not projecting prominently over orbits.
          f^1. Head and shoulders not distinctly grayish.
            g^1. Upperparts richer ochraceous-tawny. ("Mexico."). **O. fulgens** (p. 41).
            g^2. Upperparts duller ochraceous-tawny or ochraceous-buffy. (Southern Texas to Costa Rica.) .... **O. couesi** (p. 28).
          f^2. Head and shoulders distinctly grayish. (Lower California.) **O. peninsulæ** (p. 45).

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[1] Contrasting with *Melanomys*.

[2] Contrasting with *Oligoryzomys*.

e^3. Supraorbital ridges projecting prominently over orbits. (Panama.) **O. gatunensis** (p. 42).

d^2. Habitat insular.

e^1. Habitat islands off coasts of Mexico.

f^1. Upperparts ochraceous-buffy. (Maria Madre Island.). **O. nelsoni** (p. 46).

f^2. Upperparts ochraceous-tawny. (Cozumel Island.). **O. cozumelæ** (p. 43).

e^2. Habitat Greater Antilles. (Jamaica.).......... **O. antillarum** (p. 44).

c^2. Habitat United States north of Rio Grande Valley.... **O. palustris** (p. 21).

b^2. Hind foot with prominent tufts of digital bristles projecting beyond ends of three median claws.

c^1. Ears clothed externally with fine blackish hairs contrasting with color of head; hind foot long and narrow.

d^1. Hind foot less than 33.

e^1. Supraorbital vibrissæ less than 40.

^{1}. Ears clothed internally with fine blackish hairs.

g^1. Second upper molar with central enamel island present; third lower molar with outer reentrant angle extending about half way across crown.

h^1. Upperparts darker ochraceous-buff or ochraceous-tawny.

i^1. Zygomata not wider anteriorly than posteriorly, or if wider zygomatic breadth more than 14. (Atlantic slope in eastern and southern Mexico and south to Panama.) **O. alfaroi** (p. 58).

i^2. Zygomata wider anteriorly than posteriorly; zygomatic breadth 14 or less. (Pacific slope of mountains of southern Chiapas.) **O. hylocetes** (p. 70).

h^2. Upperparts paler ochraceous-buff or ochraceous-tawny. (Pacific slope of Sierra Madre in Guerrero and Oaxaca.) **O. guerrerensis** (p. 69).

g^2. Second upper molar with central enamel island absent; third lower molar with outer reentrant angle extending more than half way across crown. (Costa Rica and Panama.). **O. talamancæ** (p. 73).

f^2. Ears clothed internally with buffy or rusty reddish hairs.

g^1. Size larger; hind foot 30 or more. (Atlantic coast of Mexico.) **O. rostratus** (p. 52).

g^2. Size smaller; hind foot less than 30. (Pacific coast of Mexico.) **O. melanotis** (p. 49).

e^2. Supraorbital vibrissæ more than 50............ **O. bombycinus** (p. 76).

d^2. Hind foot 33 or more.

e^1. Color paler; supraorbital ridges absent. (Costa Rica and western Panama.) **O. devius** (p. 80).

e^2. Color darker; supraorbital ridges present. (Eastern Panama.) **O. pirrensis** (p. 81).

c^2. Ears clothed externally with coarse tawny hairs not contrasting with color of head; hind foot short and broad. (Costa Rica and Panama.) **O. tectus** (p. 84).

a^2. Habitat Lesser Antilles. (St. Vincent.)...................... **O. victus** (p. 86).

Oryzomys palustris Group.

Geographic distribution.—Coastal areas from southern New Jersey to southern Texas; north in the Mississippi Valley to southern Illinois, and southward from the Rio Grande Valley on the east, and southern

Sinaloa on the west, through Middle America to Panama, with outlying forms inhabiting southern Lower California, the Tres Marias Islands, and Cozumel Island. Confined mainly to the vicinity of water at low elevations, but ranging up to over 7,000 feet altitude in the marshy bottom of the Valley of Mexico (see maps, figs. 2 and 3).

General characters.—Size large; form robust; tail usually equal to or longer than head and body (shorter in some examples), thinly but rather distinctly haired; ears small and inconspicuous, well haired internally as well as externally; general pelage long, rather coarse and rigid; the underfur somewhat woolly; vibrissæ short, the longest arising from muzzle scarcely as long as head; hind feet broad, the upper surface rather well haired and under surface naked and coarsely granular anteriorly, becoming smooth along outer side of large posterior tubercle; inner edge of plantar surface overlapped by fringing bristles; toes of hind feet webbed near base; the claws long, relatively straight, and projecting well beyond overlapping bristles. Color of upperparts presenting a wide range of variation from grizzled grayish brown, or pale buff, to rich ochraceous-buff or ochraceous-tawny, more or less heavily overlaid with black; underparts ranging from white to light ochraceous-buff.

Skull.—Size large, with rostrum short and braincase high and well arched; outer wall of antorbital foramen with superior border extending well forward, the foramen appearing as a deep circular notch as viewed from above; frontal region rather broad, the lateral margins trenchant, somewhat upturned, and projecting as supraorbital ridges, frontals usually encroaching in a narrow point posteriorly along the median line between the parietals; temporal ridges well developed anteriorly along parieto-squamosal borders, usually becoming indistinct posteriorly in crossing lateral wings of parietals to low lambdoid crest; interparietal small, subtriangular, the anterior border a nearly straight line and the posterior with an ill-defined median angle; anterior palatine foramina narrow and much elongated, about equal in length to palatal bridge, normally reaching posteriorly to anterior plane of first molars, the median septum with posterior or maxillary portion contracted and anterior or premaxillary section expanded above; palatal pits large and normally oval in outline; interpterygoid fossa moderately broad; sphenopalatine vacuities large in *O. palustris*, absent, or present as very narrow slits, in *O. couesi* and related forms; audital bullæ large, the swollen portion projecting anteriorly beyond anterior plane of basioccipital; basioccipital narrow; angle of mandible rather broad and projecting posteriorly; coronoid process large, rising high above condyle; dentition moderately heavy; third lower molar rather short and broad; mandibular toothrow only slightly narrower posteriorly than anteriorly; inner reëntrant angles in upper molars and outer reentrant angles in lower molars reaching less than half way across moderately worn crowns; second upper molar with a somewhat crescentic enamel island, or furrow, along postero-internal base of paracone, becoming restricted and finally obliterated through extended wear; tubercle over root of lower incisor prominent.

Remarks.—The *O. palustris* group includes *O. palustris* of the United States, and *O. couesi* and nearly related Middle American forms. Aside from the darker, more brownish colors which usually characterize *O. palustris*, in contrast with the brighter, more ochraceous buffy or rufescent tones of *O. couesi* and its relatives, these sections of the group also differ notably in quality of pelage, the overfur being longer and projecting farther beyond the underfur in the former than in the latter. The forms of the two sections of the group agree closely in essential cranial details, but skulls of subspecies of *O. palustris* are usually recognizable by the large size of the sphenopalatine vacuities. Members of the group as a whole are distinguished externally from those of other Middle American groups of the same subgenus by the small size and internal as well as external hairiness of the ears.

Key to Species and Subspecies of the O. palustris Group.

[Typical adults.]

a^1. Upperparts mainly grayish or brownish, or if ochraceous-buffy or ochraceous-tawny underparts not distinctly buffy. (United States north of Rio Grande Valley [*O. palustris*].)

  b^1. Upperparts mainly grayish or brownish.

   c^1. Color darker. (Atlantic coast region from southern New Jersey to northern Florida; Alabama; southeastern Mississippi; central Tennessee; southern Kentucky; southern Illinois, and parts of southeastern Missouri.) **O. p. palustris** (p. 22).

   c^2. Color paler. (Coast region of Texas from Nueces Bay northward; Louisiana; western Mississippi; southern and eastern Arkansas; extreme southeastern Missouri; southeastern Kansas.) .... **O. p. texensis** (p. 27).

  b^2. Upperparts mainly clay color or ochraceous-tawny.

   c^1. Color duller, less distinctly ochraceous-tawny. (North-central Florida.) **O. p. natator** (p. 24).

   c^2. Color brighter, more distinctly ochraceous-tawny. (Southern Florida.) **O. p. coloratus** (p. 26).

a^2. Upperparts mainly ochraceous-buffy or ochraceous-tawny. (Rio Grande Valley to Panama and islands near coasts of Mexico and West Indies [*O. couesi* and related forms].)

  b^1. Habitat continental.

   c^1. Supraorbital ridges not projecting prominently over orbits.

   d^1. Head and shoulders not distinctly grayish.

   e^1. Upperparts duller ochraceous-tawny or ochraceous-buffy. [*O. couesi* and subspecies.]

   f^1. Underparts normally white.

   g^1. Size larger; hind foot usually 35 or more; upper molar series usually more than 5.

h^1. Upperparts more intense ochraceous-buff. (Northwestern Michoacan).. **O. c. regillus** (p. 37).
h^2. Upperparts less intense ochraceous-buff. (Central Jalisco.) **O. c. albiventer** (p. 38).
g^2. Size smaller; hind foot usually less than 35; upper molar series usually less than 5.
h^1. Upperparts darker ochraceous-buff. (Pacific coastal region from southern Sinaloa to southeastern Oaxaca.) **O. c. mexicanus** (p. 33).
h^2. Upperparts paler ochraceous-buff. (Morelos; southern Puebla; northern Oaxaca; northeastern Guerrero.). **O. c. aztecus** (p. 35).
f^2. Underparts normally buffy.
g^1. Size larger; hind foot usually more than 33; upper molar series usually more than 4.8.
h^1. Size smaller; hind foot averaging less than 35.
i^1. Color darker. (San Luis Potosi.)..... **O. c. peragrus** (p. 39).
i^2. Color paler. (Rio Grande Valley.).. **O. c. aquaticus** (p. 39).
h^2. Size larger; hind foot averaging about 36. (Valley of Mexico.) **O. c. crinitus** (p. 36).
g^2. Size smaller; hind foot usually less than 33; upper molar series usually more than 4.8.
h^1. Upperparts normally ochraceous-buffy.
i^1. Color darker. (Northern Vera Cruz to northwestern Costa Rica.)................................ **O. c. couesi** (p. 29).
i^2. Color paler. (Southwestern Gautemala and south-central Chiapas.)....................... **O. c. zygomaticus** (p. 32).
h^2. Upperparts normally ochraceous-tawny. (Lowlands of eastern Nicaragua.)......................... **O. c. richmondi** (p. 32).
e^2. Upperparts richer ochraceous-tawny. (Mexico.)...... **O. fulgens** (p. 41).
d^2. Head and shoulders distinctly grayish. (Lower California.) **O. peninsulæ** (p. 45).
c^2. Supraorbital ridges projecting prominently over orbits. (Panama.) **O. gatunensis** (p. 42).
b^2. Habitat insular.
c^1. Habitat off east coast of Mexico. (Cozumel Island.).. **O. cozumelæ** (p. 43).
c^2. Habitat off west coast of Mexico. (Maria Madre Island.). **O. nelsoni** (p. 46).
c^3. Habitat West Indies. (Jamaica.)................. **O. antillarum** (p. 44).

ORYZOMYS PALUSTRIS (Harlan).

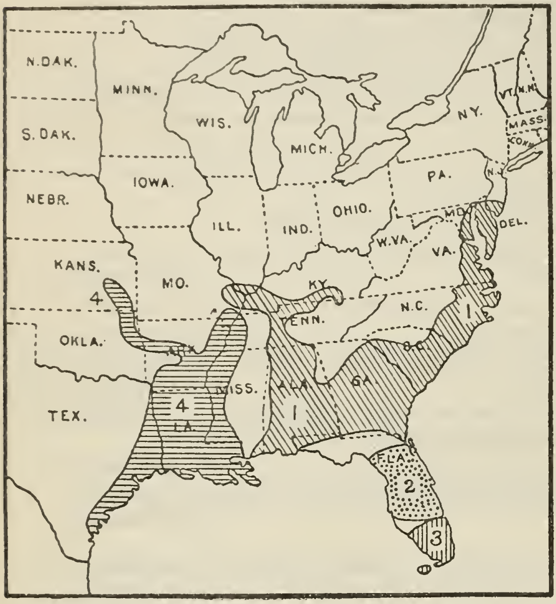
[Synonymy under subspecies.]

Geographic distribution.—Atlantic and Gulf coastal areas from southern New Jersey (not yet recorded from Delaware and Maryland, but doubtless occurs there), to southern Texas, and north through the Mississippi Valley to southern Kentucky, southern Illinois, and eastern Kansas (fig. 2). Altitudinal range from sea level up along streams to about 500 feet altitude (rarely to 1,000 feet), mainly in the Lower Austral Zone, but reaching into the Upper Austral Zone in the more northerly localities, and into the Tropical Zone in southern Florida.

General characters.—Similar in general to *O. couesi*, but pelage longer; colors usually darker and duller grayish brown instead of ochraceous-buffy or ochraceous-tawny; skull differing in various details, but dentition about the same.

Color.—Upperparts in general varying from grizzled grayish brown or pale buff, to tawny-olive, clay color, and ochraceous-tawny; the face, top of head, and back heavily lined or overlaid with black; sides paler, owing to a thinner admixture of blackish hairs; underparts white, varying to buffy white and rarely to pale buff; outer sides of ears dusky, the inner sides clothed with grayish or rusty hairs; feet whitish; tail varying from brownish above and whitish below to dusky all round. *Young* (in first pelage): Varying from grayish brown to dull tawny-olive above, whitish below.

Skull.—(For general outlines see under *O. palustris* group.) In general form closely resembling that of *O. couesi*, but sphenopalatine vacuities, absent or much reduced in size in that species, large and widely open; antorbital foramen with anterior border less rounded above, less inclined or produced forward at the base, in many examples somewhat excised or tending to develop a point as in *Sigmodon*.



1. *O.p.palustris.* 2. *O.p.natator.* 3. *O.p.coloratus.* 4. *O.p.texensis.*
FIG. 2.—Geographic distribution of subspecies of *Oryzomys palustris*.

Remarks.—*O. palustris* is divisible into four geographic races which form a closely intergrading series. The species apparently attains its largest size in Florida and along the coast of the Gulf of Mexico east of the Mississippi delta.

ORYZOMYS PALUSTRIS PALUSTRIS (HARLAN).

SWAMP RICE RAT.

[Pl. I, figs. 1, 1a; Pl. V, figs, 1, 4; Pl. VI, figs. 1, 1a.]

Mus palustris Harlan, Silliman's Amer. Journ. Sci., XXXI, p. 385, 1837.

Arvicola oryzivora, Bachman, in Audubon and Bachman, Quadr. North Amer., III, p. 214, 1854. Type from St. Johns Parish, South Carolina.

H[esperomys] palustris Wagner, in Suppl. Schreber's Saügthiere, III, p. 543, 1843.

Oryzomys palustris Baird, Mamm. North Amer., p. 459, 1857.

Type locality.—"Fastland," near Salem, Salem County, New Jersey.

Type.—Not known to exist.

Geographic distribution.—Atlantic coastal areas from southern New Jersey (not yet known from Delaware or Maryland, but doubtless occurs there) south to northeastern Florida, thence westward through southern Georgia to the Gulf coast of Alabama and Mississippi, and north through Alabama and western Tennessee to southwestern Kentucky, southern Illinois, and parts of southeastern Missouri. Altitudinal range from sea level up along streams to about 500 feet (rarely to 1,000 feet), mainly in Lower Austral Zone, but reaching into Upper Austral Zone in southern New Jersey, southeastern Kentucky, and southeastern Missouri (Marble Hill).

General characters.—Size usually smaller and color more brownish, less tawny, than in *O. p. natator* and *O. p. coloratus;* skull less massive. Closely resembling *O. p. texensis*, but darker, more brownish than topotypes of the latter form; skull broader.

Color.—*Fresh pelage* (December): Upperparts grizzled grayish brown or pale buff, the brownish or buffy tone most intense on rump, darkened on face, top of head, and back by overlying blackish hairs; feet whitish; tail brownish above, whitish below, becoming in some specimens dark all round near tip. *Young* (in first pelage): Grayish brown above, dull whitish below.

Skull.—(For general outlines see under *O. palustris* group.) Very similar to those of *O. p. natator* and *O. p. coloratus*, but narrower; braincase decidedly narrower; zygomata less widely spreading; frontal region narrower, the supraorbital borders less projecting. Compared with that of *O. p. texensis* the skull differs mainly in somewhat larger average size; zygomata usually more widely spreading.

Measurements.—Average of four adults from Greenwich, N. J. (near type locality): Total length, 242 (237–245); tail vertebræ, 112 (109–116); hind foot, 31 (30–31.5). An adult from Pope Creek, Va.: 260; 130; 33. Average of four adults from Georgetown, S. C.: 257 (233–273); 125 (113–132); 32.5 (31–33). Average of three adults from Bon Secour, Ala.: 265 (250–280); 131 (125–138); 30.5 (30–31.5). Adult from Bayou La Batre, La.: 233; 116; 30. Adult from Marble Hill, Mo.: 252; 115; 29. Adult from Olive Branch, Ill.: 255; 113 29. Adult from Barbourville, Ky.: 270; 133; 30.5. *Skull* (two adults from Greenwich, N. J.: Greatest length, 32.4, 31; zygomatic breadth, 17.2, 16.6; interorbital breadth, 5.2, 5.1; width of braincase, 11.9, 12; nasals, 12.7, 12; anterior palatine foramina, 6.7, 6.7; palatal bridge, 6.2, 6.2; upper molar series, 4.5, 4.6.

Remarks.—*O. p. palustris* passes into *O. p. texensis* in the Mississippi Valley. Specimens from Marble Hill, Mo., and Olive Branch, Ill., however, seem referable to the typical form. A tendency to develop the ruddy color and more massive skull of *O. p. natator* is exhibited by specimens from New Berlin and Burnside Beach, northern Florida, and intergradation of the two forms seems evident in that part of the State. No rice rats have been recorded from Delaware or Maryland, but the favorable character of the country and the narrowness of the gap between collecting stations to the north and south point to probable continuity of range. Specimens from South Carolina apparently representing *Arvicola oryzivora* of Audubon and Bachman are inseparable from typical *palustris*.

Specimens examined.—Total number, 233, as follows:

Alabama: Autaugaville, 1; Bayou La Batre, 2; Bon Secour, 3; Elmore, 1; Florence, 1; Gallion, 1; Hayneville, 2; Huntsville, 4; Jackson, 2; Mobile, 1; Montgomery, 1; Mount Weogufka, 1; Reform, 1; Sand Mountain (near Carpenter), 1; Seale, 1.
Florida: Burnside Beach, 9;[1] New Berlin, 8.[2]
Georgia: Cumberland Island, 14;[3, 4] Hursman Lake, 1;[1] McIntosh County, 1; Okefinokee Swamp, 1;[2] Ossabaw Island, 12;[1] Riceboro, 7;[5] Saint Marys, 20;[3, 6] Savannah, 10; Toccoa, 2.
Illinois: Olive Branch, 3.
Kentucky: Barbourville, 3.
Missouri: Marble Hill, 1.
Mississippi: Biloxi, 1.
New Jersey: Cedar Creek, 1;[7] Greenwich, 13.[8]
North Carolina: Coinjock, 1; Pea Island, 2;[1] Raleigh, 31.[9, 10]
South Carolina: Beaufort County, 2; Calhoun Falls, 2;[2] Easley, 1; Frogmore, 1;[3] Georgetown, 11; Plantersville, 7; Saint Helena Island, 1; Society Hill, 3.
Tennessee: High Cliff, 1; Lawrenceburg, 2.
Virginia: Dismal Swamp, 20; Pope Creek (5 miles southeast of Colonial Beach), 2; Smith Island, 6; Suffolk, 1; Wallops Island, 3; Warsaw (4 miles southwest), 5; Wreck Island, 1.

ORYZOMYS PALUSTRIS NATATOR Chapman.

Central Florida Rice Rat.

Oryzomys palustris natator Chapman, Bull. Amer. Mus. Nat. Hist., V., p. 44, March 17, 1893.

Type locality.—Gainesville, Alachua County, Florida.

Type.—No. $\frac{1813}{1089}$, ♂ adult, American Museum of Natural History; collected by F. M. Chapman, January 31, 1889.

Geographic distribution.—Central Florida, north of Everglades; Austroriparian division of Lower Austral Zone.

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[1] Collection Mus. Comp. Zool.

[2] Collection Field Mus. Nat. Hist.

[3] Collection Amer. Mus. Nat. Hist.

[4] Eleven in collection Mus. Comp. Zool.

[5] Five in collection Field Mus. Nat. Hist.

[6] Three in collection Field Mus. Nat. Hist.; 15 in Mus. Comp. Zool.

[7] Collection Acad. Nat. Sci. Philadelphia.

[8] Five in collection Acad. Nat. Sci. Philadelphia.

[9] Five in collection Amer. Mus. Nat. Hist.

[10] Two in collection Field Mus. Nat. Hist.; 6 in Mus. Comp. Zool.

General characters.—Most like *O. p. coloratus;* differing usually in less intense tawny suffusion of upperparts, especially cheeks and sides of body. Size larger, color more tawny, and skull more massive than usual in *O. p. palustris* or *O. p. texensis.*

Color.—*Fresh pelage* (December): Upperparts varying from grizzled grayish brown or pale buff to tawny-olive, clay color, or ochraceous-tawny, deepest and richest on lower part of back and rump, becoming paler and more buffy on sides, and darkened dorsally by admixture of blackish hairs; face grayish or pale buffy beneath overlying dusky hairs; underparts usually white, but in some specimens more or less suffused with pale buff; feet white; tail brownish above, whitish below, becoming in some specimens dark all round toward tip. *Young* (in first pelage): Brownish or dull tawny-olive mixed with black above, whitish below.

Skull.—Similar to those of *O. p. palustris* and *O. p. texensis,* but broader; braincase decidedly broader; zygomata more widely spreading; frontal region broader, the supraorbital borders more projecting. Comparison with the skull of *O. p. coloratus* reveals no appreciable difference.

Measurements.—Type: Total length, 295; tail vertebræ, 143; hind foot (dry skin), 33. Average of 10 adults (type and 9 topotypes): 276.7 (271–300); 142.9 (132–156); 34.3 (32.5–37). *Skull* (average of 6 adults, type and 5 topotypes): Greatest length, 32.4 (31.4–33.7); zygomatic breadth, 17.2 (16.4–17.7); interorbital breadth, 5.4 (5.1–6.1); width of braincase, 12.4 (12–12.8); nasals, 12.7 (12–13.5); anterior palatine foramina, 6.9 (6.4–7.2); palatal bridge, 6.1 (5.7–6.5); upper molar series, 4.7 (4.5–4.9).

Remarks.—In northern Florida, not far to the northward of the type locality, *O. p. natator* passes into *O. p. palustris,* as shown by specimens from New Berlin and Burnside, which, however, seem more properly placed with the latter form. In the vicinity of Lake Okechobee *natator* merges with *O. p. coloratus,* a richer colored form inhabiting the southern part of the State.

Specimens examined.—Total number, 121, as follows:

Florida: Anastasia Island, 2;[1] Canaveral, 4; Cape Canaveral, 3; Cartersville, 1; Crystal River, 1;[1] Enterprise, 26;[2] Espanita, 3;[3] Fort Kissimmee, 1; Gainesville, 19 (type and topotypes);[4] Geneva, 1; Kissimmee, 2; Kissimmee River, 2; Lake Harney, 11; Lake Kissimmee, 19; Micco, 9;[5] Mullet Lake, 1; Oak Lodge, 9;[1] Ocala, 2; Tarpon Springs, 1;[6] Titusville, 4.

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[1] Collection Mus. Comp. Zool.

[2] Fourteen in collection Amer. Mus. Nat. Hist.; 10 in Field Mus. Nat. Hist.; 2 in Mus. Comp. Zool.

[3] Collection Field Mus. Nat. Hist.

[4] Nine in collection Amer. Mus. Nat. Hist.; 5 in Field Mus. Nat. Hist.; 5 in Mus. Comp. Zool.

[5] Three in collection Amer. Mus. Nat. Hist.; 3 in Field Mus. Nat. Hist.

[6] Collection Acad. Nat. Sci. Philadelphia.

ORYZOMYS PALUSTRIS COLORATUS Bangs.

Everglades Rice Rat.

(Pl. I, figs. 2, 2a.)

Oryzomys palustris coloratus Bangs, Proc. Boston Soc. Nat. Hist., XXVIII, p. 189, March, 1898.

Oryzomys natator floridanus Merriam, Proc. Washington Acad. Sci., III, p. 277, July 26. 1901. Type from Everglade, Florida, No. 71349, ♂ ad., U. S. Nat. Mus. (Biological Survey collection); collected by J. Alden Loring, March 29, 1895.

Type locality.—Cape Sable, Monroe County, Florida.

Type.—No. 4470, ♂ adult, Museum of Comparative Zoology (collection of E. A. and O. Bangs); collected by C. L. Brownell, April 17, 1895.

Geographic distribution.—Tropical southern Florida, north to Lake Okechobee.

General characters.—Closely resembling *O. p. natator;* differing in more intense tawny suffusion of upperparts; size about the same. Size larger than usual in *O. p. palustris* and *O. p. texensis,* and color much more tawny than either.

Color.—About as in *O. p. natator,* but general tone of upperparts slightly richer, more tawny or rufescent.

Skull.—Like that of *O. p. natator.*

Measurements.—Type: Total length, 301; tail vertebræ, 150; hind foot, 35. Average of three adult topotypes: 296 (278–305); 144 (133–152); 33.4 (33.4–33.4). *Skull* (average of four adults, type and three topotypes): Greatest length, 32.2 (31.8–32.7); zygomatic breadth, 17.1 (16.8–17.5); interorbital breadth, 5.8 (5.8–5.9); width of braincase, 12.4 (12.2–12.5); nasals, 12.4 (12.1–12.6); anterior palatine foramina, 6.6 (6.3–7); palatal bridge, 6.1 (5.7–6.6); upper molar series, 4.8 (4.7–4.9).

Remarks.—*O. p. coloratus* requires close comparison with *O. p. natator,* from which it apparently differs only in color. The richer tone in *coloratus* is most noticeable when specimens are turned on their sides, and the cheeks and flanks contrasted with those of examples of *natator.* As Bangs rightly states, *coloratus* "occupies only the southern, tropical part of the Florida peninsula."

In describing "*Oryzomys natator floridanus,*" Merriam overlooked the name *coloratus,* which had already been applied to the animal of the region; the two are clearly synonymous.

Specimens examined.—Total number, 50, as follows:

Florida: Cape Sable, 11 (type and topotypes);[1] Eden, 1; Everglade, 16 (including type of "*floridanus*"); Flamingo, 13;[2] Juno (Lake Worth), 5; Jupiter, 2;[1] Miami, 1; Miami River, 1.

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[1] Collection Mus. Comp. Zool.

[2] Twelve in collection Mus. Comp. Zool.; 1 in Amer. Mus. Nat. Hist.

ORYZOMYS PALUSTRIS TEXENSIS Allen.

TEXAS RICE RAT.

Oryzomys palustris texensis Allen, Bull. Amer. Mus. Nat. Hist., VI, p. 177, May 31, 1894.

Type locality.—Rockport, Aransas County, Texas.

Type.—No. $\frac{7138}{5764}$, ♂ ad., American Museum of Natural History; collected by H. P. Attwater, November 15, 1893.

Geographic distribution.—From Corpus Christi Bay north and east along the Gulf coast of Texas and Louisiana to the delta of the Mississippi, thence north in the Mississippi Valley to southeastern Missouri; general range reaching southeastern Kansas, probably by way of the Arkansas River valley through Oklahoma (not yet known from Oklahoma); altitudinal range in Austroriparian Zone, mainly below 500 feet, but extending up to about 1,000 feet in Kansas.

General characters.—Closely resembling *O. p. palustris*, but typical examples paler; skull usually narrower. Color paler, less rufescent, and skull decidedly narrower, less massive, than in *O. p. natator* and *O. p. coloratus*.

Color.—About as in *O. p. palustris*, but averaging slightly paler. An ochraceous-tawny suffusion of upperparts and underparts is shown in rare examples.

Skull.—About like that of *O. p. palustris*, but averaging somewhat smaller, with less widely spreading zygomata. Similar to that of *O. p. natator*, but narrower; braincase decidedly narrower; zygomata less widely spreading; frontal region narrower, the supraorbital borders less projecting.

Measurements.—Type: Total length, 256; tail vertebræ, 139; hind foot, 30.5. Average of eight adult topotypes: 242 (226–279); 120 (108–133); 29 (28.5–30.5). *Skull* (average of 5 adults—type and 4 topotypes): Greatest length, 31 (30–32.1); zygomatic breadth, 16 (15.2–16.8); interorbital breadth, 5.3 (5.2–5.4); width of braincase, 11.8 (11.1–12.3); nasals, 12.5 (12–12.9); anterior palatine foramina, 6.1 (5.7–6.5); palatal bridge, 5.8 (5.5–6.1); upper molar series, 4.4 (4.3–4.7).

Remarks.—Specimens from the type locality are paler than those from other localities in the immediate vicinity, some of which are practically indistinguishable from many typical examples of *O. p. palustris*. Moreover, in cranial characters, especially in width of braincase and outward spread of zygomata (characters which distinguish *O. p. texensis* from *O. p. natator* and *O. p. coloratus*), *texensis* very closely approaches *palustris*. The skull of the type and larger topotypes of *texensis* seem inseparable from some of the smaller skulls of comparable age from the region of the type locality of *palustris*. The cranial difference noted, however, affects the majority of individuals, and together with a tendency toward pallid coloration exhibited by animals inhabiting a wide area, seems to entitle *texensis* to recognition as a separate form. The few specimens available from Arkansas, western Tennessee, and extreme southeastern Missouri seem referable to *texensis*, but approach *palustris* so closely that they might with nearly equal propriety be assigned to that subspecies.

Specimens examined.—Total number, 110, as follows:

Arkansas: Camden, 2; Delight, 1; Lake City, 1; Wilmot, 1.

Kansas: Neosho Falls, 2.[1]

Louisiana: Burbridge, 18;[2] Gibson, 4;[2] Houma, 1; Iowa, 3; Lake Catherine, 6;[3] Main Pass, 2; Mermenton, 4;[4] New Orleans, 2.

Mississippi: Fayette, 1.

Missouri: Kennett, 2; Portageville, 1.

Tennessee: Arlington, 1.

Texas: Corpus Christi, 7;[5] Matagorda, 7; Matagorda Island, 2; Matagorda Peninsula, 1; Nueces Bay, 5; Padre Island, 4; Port Lavaca, 4; Rockport, 24 (type and topotypes);[6] Sabine, 1; Victoria, 1; Virginia Point, 1; Wharton County, 1.[3]

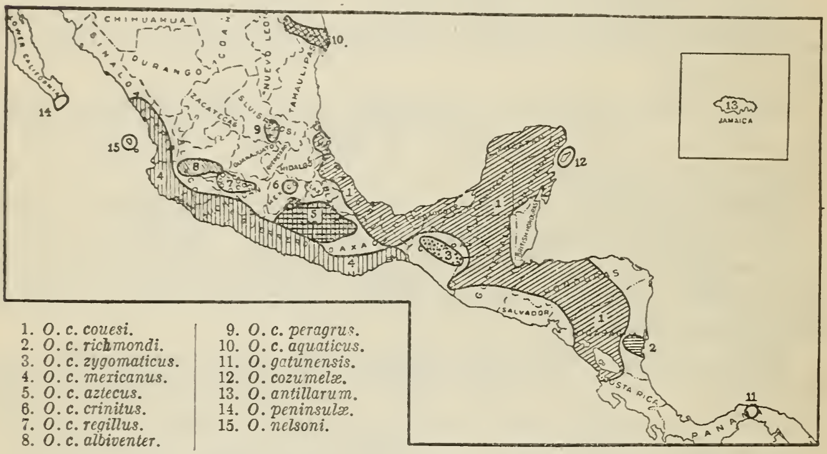

FIG. 3.—Geographic distribution of *Oryzomys couesi* and related species.

ORYZOMYS COUESI (Alston).

[Synonymy under subspecies.]

Geographic distribution.—River valleys and marshy areas from southern Texas on the east and southern Sinaloa on the west, south through central and southern Mexico, Guatemala, Honduras, and Nicaragua to northern Costa Rica. Altitudinal range from sea level, regardless of latitude, to over 7,000 feet in the Valley of Mexico; zonal range mainly Tropical but reaching into Sonoran Zone on the tableland of Mexico (fig. 3).

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[1] One in Mus. Comp. Zool.

[2] Collection Mus. Comp. Zool.

[3] Collection Amer. Mus. Nat. Hist.

[4] Collection Field Mus. Nat. Hist.

[5] One in collection Amer. Mus. Nat. Hist.

[6] Nineteen in collection Amer. Mus. Nat. Hist.; 2 in Field Mus. Nat. Hist.; 1 in Mus. Comp. Zool.

General characters.—Similar in general to *O. palustris*, but pelage shorter; colors usually brighter and richer, ochraceous-buffy or ochraceous-tawny instead of grayish brown; skull differing in various details, but dentition about the same.

Color.—Upperparts varying from light buff or pinkish buff through ochraceous-buff to ochraceous-tawny, more or less suffused with tawny or russet, the general shade paler on cheeks, shoulders, and along sides, becoming deeper, more intense, and darkened on face, top of head, and back by admixture of black hairs; underparts varying from nearly pure white through light buff to light ochraceous-buff, more or less suffused with pale salmon color; outer sides of ears blackish, inner sides moderately clothed with short hairs varying from grayish to ochraceous-buff or rusty reddish; feet white; tail dark brownish above, whitish or light brownish below.

Skull.—(For general outlines see under *O. palustris* group.) In general form closely resembling that of *O. palustris*, but sphenopalatine vacuities, large in that species, absent or much reduced in size; antorbital foramen with anterior border more rounded above, more inclined or produced forward at the base, not excised or tending to develop the somewhat *Sigmodon*-like point often present in *palustris;* interparietal with a more evident posterior angle.

Remarks.—Ten geographic races of *O. couesi* appear to be recognizable in the area between the valley of the Rio Grande, Texas, and northern Costa Rica. While all the more minute steps of intergradation are not always shown by the material now available, mainland forms throughout this wide interval agree so closely in all essential details that they seem safely assignable to a single species. Several outlying insular forms (and *O. peninsulæ* of Lower California) exhibit more distinctive characters and are accorded specific rank, but they are clearly related to the widely ranging *O. couesi* section of the *O. palustris* group.

ORYZOMYS COUESI COUESI (Alston).

Coues Rice Rat.

(Pl. I, figs. 3, 3a.)

Hesperomys couesi Alston, Proc. Zool. Soc. London, 1876, p. 756.

Oryzomys couesi Thomas, Ann. Mag. Nat. Hist., ser. 6, XI, p. 403, May 1893 (type and locality fixed).

Oryzomys jalapæ Allen and Chapman, Bull. Amer. Mus. Nat. Hist., IX, p. 206, June 16, 1897. Type from Jalapa, Vera Cruz, Mexico (altitude 4,400 ft.). No. $\frac{12551}{10861}$, ♂ ad., Amer. Mus. Nat. Hist.; collected by F. M. Chapman, April 16, 1897.

Oryzomys jalapæ rufinus Merriam, Proc. Washington Acad. Sci., III, p. 285, July 26, 1901. Type from Catemaco, Vera Cruz, Mexico (altitude 1,000 feet). No. 65499, ♀ ad., U. S. Nat. Mus. (Biological Survey collection); collected by Nelson and Goldman, April 27, 1894.

Oryzomys teapensis Merriam, Proc. Washington Acad. Sci., III, p. 286, July 26, 1901. Type from Teapa, Tabasco, Mexico. No. 99973, ♂ subad., U. S. Nat. Mus. (Biological Survey collection); collected by Nelson and Goldman, April 4, 1900.

Oryzomys goldmani Merriam, Proc. Washington Acad. Sci., III, p. 288, July 26, 1901. Type from Coatzacoalcos, Vera Cruz, Mexico (near sea level). No. 78110, ♀ ad., U. S. Nat. Mus. (Biological Survey collection); collected by Nelson and Goldman, April 11, 1896.

Oryzomys jalapæ apatelius Elliot, Field Columb. Mus., publ. 90, zool. ser., III, p. 266, March 8, 1904. Type from San Carlos, Vera Cruz, Mexico. No. 13107, ♀ ad., Field Mus. Nat. Hist.; collected by N. G. Buxton, March 1, 1903.

Oryzomys richardsoni Allen, Bull. Amer. Mus. Nat. Hist., XXVIII, p. 99, April 30, 1910. Type from Pena Blanca, Nicaragua. No. 29800, ♂ ad., Amer. Mus. Nat. Hist.; collected by Wm. B. Richardson, May 25, 1909.

Type locality.—Coban, Guatemala.

Type.—In British Museum; collected by Osbert Salvin.

Geographic distribution.—From northern Vera Cruz southeastward through eastern Puebla, eastern Oaxaca, northern and extreme southern Chiapas, Tabasco, Campeche, Yucatan, Quintana Roo, Guatemala, Honduras, and Nicaragua, to northwestern Costa Rica; altitudinal range from sea level to about 5,000 feet mainly in Humid Lower Tropical Zone.

General characters.—Size about as in *O. c. zygomaticus*, *O. c. mexicanus* and *O. c. richmondi;* color slightly darker than in *zygomaticus*, decidedly darker than in *mexicanus*, and decidedly paler than in *richmondi;* skull about like those of *mexicanus* and *richmondi;* sphenopalatine vacuities absent or represented by very narrow slits as usual in the *O. couesi* section of the *O. palustris* group. Similar in general to *O. c. peragrus*, but somewhat smaller, with upperparts, especially cheeks, shoulders, and sides, more ochraceous-buffy; skull less massive.

Color.—*Fresh pelage:* Upperparts varying from ochraceous-buffy to ochraceous-tawny, deepened in rare examples to light cinnamon-brown, lightest on cheeks, shoulders, and along sides, the face, top of head, and back much darkened by black hairs; underparts varying from light buff to light ochraceous buff (rarely dull white); outer sides of ears blackish, the inner sides clothed with short ochraceous-buffy hairs; feet white; tail brownish above, dull yellowish below proximally, becoming light brownish toward tip.

Skull.—About as in *O. c. zygomaticus*, *O. c. mexicanus*, and *O. c. richmondi;* differing mainly in smaller general size, decidedly narrower braincase, and smaller molars than those of *O. c. crinitus*, *O. c. albiventer*, and other Mexican tableland forms. Similar to that of *O. c. peragrus*, but braincase narrower.

Measurements.—Average of 4 adults from Tumbala, Chiapas: Total length, 252 (242–265); tail vertebræ, 130 (127–135); hind foot, 30.7 (30–31). Average of 10 adults from Yaruca, Honduras: 267.5 (255–280); 138 (130–145); 29.1 (28–32). Average of seven adults from Orizaba, Vera Cruz: 263 (248–294); 148 (139–174); 33.1

(32–34.5). *Skull* (average of 5 adults from Yaruca, Honduras): Greatest length, 30.5 (29.9–31.3); zygomatic breadth, 16 (15.5–17.2); interorbital breadth, 4.8 (4.5–5.1); width of braincase, 11.4 (11.2–11.6); nasals, 11.9 (11.4–12.4); anterior palatine foramina, 6 (5.5–6.2); palatal bridge, 5.5 (5.3–6.1); upper molar series, 4.7 (4.5–4.8).

Remarks.—In the absence of material from the type locality as fixed by Thomas, specimens from Tumbala, Chiapas; and Yaruca, Honduras, which agree closely with his description, are assumed to represent typical *couesi* and have been used as a basis for comparison. Individual variation in size, color, and cranial details exhibited by every large series of *O. c. couesi* is very striking, but the form maintains with remarkable constancy its essential characters throughout its wide range. Examples from northern Vera Cruz and eastern Puebla present the same general variations and are not satisfactorily separable from those from Honduras and Nicaragua. This variation has resulted in the publication of several names based on characters which prove to be inconstant in the large number of specimens passed in review. Specimens from various localities indicate direct intergradation with *O. c. zygomaticus*, *O. c. mexicanus*, and *O. c. peragrus*.

Specimens examined.—Total number, 199, as follows:

Campeche: La Tuxpeña, 1.
Chiapas: Chicharras, 4; Tumbala, 6.
Costa Rica: Bahia de Salinas, 1.[1]
Guatemala: Jacaltenango, 3.
Honduras: Yaruca, 35.[2]
Nicaragua: Chontales, 22;[1] Matagalpa, 4;[1] Ocotal, 2;[1] Peña Blanca, 8 (including type of "*richardsoni*");[1] Quilali, 1;[1] Rio Coco, 14;[1] Rio Grande, 1;[1] Rio San Juan del Norte, 1;[1] Rio Tuma, 2;[1] San Juan, 1;[1] Tuma, 5;[1] Uluce, 1;[1] Vijagua, 2.[1]
Oaxaca: Comaltepec, 1; Guichicovi, 3; Reforma, 1[3]; Santo Domingo (mountain near), 8; Tuxtepec, 2.
Puebla: Huauchinango, 1; Metlaltoyuca, 11.
Quintana Roo: Santa Lucia, 3.[4]
Tabasco: Teapa, 3 (including type of "*teapensis*").
Vera Cruz: Achotal, 4;[3] Buena Vista, 2; Catemaco, 2 (including type of "*rufinus*"); Jalapa, 4 (including type of "*jalapæ*");[1] Pasa Nueva, 1;[1] Coatzacoalcos, 3 (including type of "*goldmani*"); Jico, 2;[3] Mirador, 1; Motzorongo, 1; San Carlos, 3 (including type of "*apatelius*");[3] Orizaba, 16;[5] Rivera (75 miles south), 1; Papantla, 1· Teocelo, 1;[4] Tlacotalpam, 7; Ubero, 1.
Yucatan: Rio Lagartos, 2.[3]

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[1] Collection Amer. Mus. Nat. Hist.

[2] Twenty-six specimens in Mus. Comp. Zool.; 6 in Field Mus. Nat. Hist.

[3] Collection Field Mus. Nat. Hist.

[4] Collection Mus. Comp. Zool.

[5] Two in Field Mus. Nat. Hist.

ORYZOMYS COUESI RICHMONDI Merriam.

Richmond Rice Rat.

Oryzomys richmondi Merriam, Proc. Washington Acad. Sci., III, p. 284, July 26, 1901.

Type locality.—Escondido River (50 miles above Bluefields), Nicaragua.

Type.—No. $\frac{36340}{48705}$, ♂ adult, United States National Museum (Biological Survey collection); collected by Charles W. Richmond, June 21, 1892.

Geographic distribution.—Low river valleys of eastern Nicaragua; Humid Lower Tropical Zone.

General characters.—Size and proportions about as in *O. c. couesi;* color decidedly darker.

Color.—Similar to that of *O. c. couesi,* but decidedly darker, more regularly ochraceous-tawny, the back and upper part of sides more heavily darkened by admixture of black hairs; underparts light ochraceous-buff.

Skull.—As in *O. c. couesi.*

Measurements.—Type: Total length, 295; tail vertebræ, 150; hind foot, 33.5. Average of 10 adults (type and nine topotypes): 275.8 (255–295); 137 (124–151); 30.9 (29–33. 5). *Skull* (average of 5 adults—type and 4 topotypes): Greatest length, 31.8 (31.2–33.3); zygomatic breadth, 16.9 (16.4–17.9); interorbital breadth, 5.1 (5–5.3); width of braincase, 11.7 (11–11.9); nasals, 12.3 (11.6–13); anterior palatine foramina, 6 (5.8–6.2); palatal bridge, 5.8 (5.7–5.9); upper molar series, 4.5 (4.3–4.6).

Remarks.—This form, the darkest of the *O. couesi* series, is known only from low elevations in eastern Nicaragua, where Richmond found it inhabiting banana plantations. Although much darker in general tone of upperparts than most examples of *O. c. couesi* from adjacent territory, close agreement in all other important respects points to complete intergradation with the latter.

Specimens examined.—Total number, 35, as follows:

Nicaragua: Escondido River (50 miles above Bluefields, 12[2] [type and topotypes]; 45 miles above Bluefields, 18; 40 miles above Bluefields, 3; 25 miles above Bluefields, 1; 16 miles above Bluefields, 1).

ORYZOMYS COUESI ZYGOMATICUS Merriam.

Guatemalan Rice Rat.

Oryzomys zygomaticus Merriam, Proc. Washington Acad. Sci., III, p. 285, July 26, 1901.

Type locality.—Nenton, Guatemala (altitude 3,000 feet).

Type.—No. 76794, ♂ adult United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, December 15, 1895.

Geographic distribution.—Known only from the Chiapas River valley in southwestern Guatemala and south-central Chiapas; Arid Lower Tropical Zone.

General characters.—Closely resembling *O. c. couesi* and *O. c. mexicanus*, but upperparts slightly paler than in the former and slightly darker than in the latter.

Color.—About as in *O. c. couesi* but averaging slightly paler, the general tone ochraceous-buff as in the palest examples of *O. c. couesi;* underparts nearly pure white in the type, varying to light buff in other examples.

Skull.—As in *O. c. couesi.*

Measurements.—Type: Total length, 290; tail vertebræ, 152; hind foot, 33. *Skull* (type): Greatest length, 30.9; zygomatic breadth, 26.9; interorbital breadth, 4.8; width of braincase, 11.6; nasals, 11.6; anterior palatine foramina, 6; palatal bridge, 5.9; upper molar series, 4.6.

Remarks.—*O. c. zygomaticus* seems to be a slightly differentiated and rather localized form intermediate in color and geographic position between *O. c. couesi* and *O. c. mexicanus.* It doubtless intergrades directly with *couesi*, the type of which came from a higher elevation about 100 miles to the eastward in central Guatemala. Three specimens from Jacaltenango, at about 5,500 feet altitude, only a few miles to the southeast, are appreciably darker in color and seem to represent typical *couesi.* Near the Pacific Coast in southwestern Chiapas, *zygomaticus* doubtless passes into *mexicanus*, which differs mainly in having slightly paler color.

Specimens examined.—Total number, 5, as follows:

Chiapas: Ocuilapa, 1.
Guatemala: Nenton, 4 (type and topotypes).

ORYZOMYS COUESI MEXICANUS Allen.

Mexican Rice Rat.

Oryzomys mexicanus Allen, Bull. Amer. Mus. Nat. Hist., IX, p. 52, March 15, 1897.

Oryzomys bulleri Allen, Bull. Amer. Mus. Nat. Hist., IX, p. 53, March 15, 1897. Type from Valle de Banderas, Tepic, Mexico, No. $\frac{8329}{6663}$, ♂ subad., Amer. Mus. Nat. Hist.; collected by Audley C. Buller, February 2, 1893.

Oryzomys rufus Merriam, Proc. Washington Acad. Sci., III, p. 287, July 26, 1901. Type from Santiago, Tepic, Mexico (altitude 200 feet). No. 91404, ♀ old, U. S. Nat. Mus. (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, June 20, 1897.

Type locality.—Hacienda San Marcos, Tonila, Jalisco, Mexico (altitude 3,500 feet).

Type.—No. $\frac{2650}{2128}$, ♂ adult, American Museum of Natural History; collected by Audley C. Buller, December 30, 1889.

Geographic distribution.—Pacific coastal plains and basal mountain slopes from southern Sinaloa to southeastern Oaxaca, Mexico; altitudinal range from sea level to about 1,000 feet (rarely to 3,500 feet), mainly in Arid Lower Tropical Zone.

General characters.—Size and proportions about as in *O. c. couesi;* color of upperparts rather decidedly paler, more ochraceous-buffy; underparts usually white, but varying to light buff, or light ochraceous-buff, the normal shades in *couesi.* Slightly paler than *O. c. zygomaticus;* slightly darker than *O. c. aztecus,* with smaller molar teeth. Similar in color to *O. c. albiventer,* but size smaller, and skull differing in detail.

Color.—Fresh pelage: Upperparts in general varying shades of ochraceous-buff, more or less suffused with tawny in old adults, becoming warm buff on cheeks, shoulders, and along lower parts of sides; the face, top of head, and back moderately darkened by blackish hairs; underparts usually nearly pure white, but varying to light buff; outer sides of ears dusky, the inner sides clothed with grayish or rusty reddish hairs; feet white; tail brownish above, dull yellowish below on proximal portion, becoming light brownish toward tip. *Young* (in first pelage): Upperparts near tawny-olive, the general tone darker and duller than in adults.

Skull.—About as in *O. c. couesi.* Differing from those of *O. c. aztecus, O. c. regillus,* and *O. c. albiventer* most noticeably in smaller size of molar teeth, the toothrows being correspondingly shortened.

Measurements.—Average of 10 adults from Escuinapa, Sinaloa: Total length, 251.4 (239–273); tail vertebræ, 137.4 (127–165); hind foot, 28.9 (27–35). *Skull* (average of same): Greatest length, 31.2 (29.8–33); zygomatic breadth, 17 (16.1–17.8); interorbital breadth, 4.8 (4.5–5.3); width of braincase, 11.6 (11.3–12.2); nasals, 12.2 (11.1–13.4); anterior palatine foramina, 6.1 (5.8–6.7); palatal bridge, 5.5 (4.8–6); upper molar series, 4.4 (4.2–4.8).

Remarks.—The narrow distribution area of *O. c. mexicanus* along the west coast of Mexico somewhat parallels that of *O. c. couesi* along the east coast; and as in that form, wide range of individual variation in size and color has resulted in the publication of names which appear to be based on unstable characters. While individuals vary notably in size and contour, as shown by every large series, skulls of *mexicanus* and *couesi* seem indistinguishable, their general characters being maintained with remarkable uniformity throughout the combined ranges of the two forms. Intergradation of *mexicanus* with *couesi* seems to be indicated by specimens from the Isthmus of Tehuantepec, and with *O. c. aztecus* by examples from the valley of the Balsas River in Guerrero.

Specimens examined.—Total number, 106, as follows:

Colima: Armeria, 11; Hacienda Magdalena, 2.
Guerrero: Ometepec, 7.
Jalisco: Hacienda San Marcos, 1 (type).[1]
Michoacan: La Huacana, 5.
Oaxaca: Huilotepec, 2; Juchitan, 1; Llano Grande, 5; Pluma, 3; Puerto Angel, 8; Reforma, 1;[2] Santa Efigenia, 1; Tehuantepec, 1.
Sinaloa: Escuinapa, 47;[1] Mazatlan, 1;[3] Rosario, 2.[4]
Tepic: San Blas, 4; Santiago, 2 (including type of "*rufus*"); Valle de Banderas, 2 (including type of "*bulleri*").

ORYZOMYS COUESI AZTECUS Merriam.

Aztec Rice Rat.

Oryzomys crinitus aztecus Merriam, Proc. Washington Acad. Sci., III, p. 282, July 26, 1901.

Type locality.—Yautepec, Morelos, Mexico (altitude 4,000 feet).

Type.—No. 51173, ♂ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, January 16, 1893.

Geographic distribution.—Interior river valleys of Morelos, southern Puebla, northern Oaxaca, and northeastern Guerrero, Mexico; altitudinal range from about 3,000 to at least 4,000 feet in Arid Lower Tropical Zone.

General characters.—A pale form with white underparts and rather heavy dentition. Closely resembling *O. c. mexicanus*, but paler in color and with heavier dentition than usual in that subspecies. Differing from *O. c. crinitus* in paler upperparts, white instead of buffy underparts, and in cranial details.

Color.—As in the paler examples of *O. c. mexicanus*, the prevailing tone beneath the dark hairs on the back pale ochraceous-buff; underparts nearly pure white.

Skull.—About like that of *O. c. mexicanus*, but molar teeth larger. Similar to that of *O. c. crinitus*, but braincase narrower and molars slightly smaller.

Measurements.—Type: Total length, 290; tail vertebræ, 154; hind foot, 35. Two adults from Puente de Ixtle, Morelos: 318, 313; 160, 170; 34, 33. *Skull* (type): Greatest length, 32.4; zygomatic breadth, 17; interorbital breadth, 5.2; width of braincase, 12.2; nasals, 12.9; anterior palatine foramina, 6.4; palatal bridge, 6.2; upper molar series, 5.

Remarks.—*O. c. aztecus* is the palest form of the *O. couesi* series, but the light ochraceous tone of the upperparts is very closely approached by the paler examples of *O. c. mexicanus*, *O. c. albiventer*, and *O. c. aquaticus*. Specimens from the valley of the Balsas River in Guerrero and from northern Puebla approach *mexicanus* in dentition, as well as color, and might with nearly equal propriety be referred to that subspecies. The characters separating *aztecus* and *O. c. crinitus* are rather slight, as indicated in the original descriptions, and it seems best to regard both as forms of *O. couesi*.

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[1] Collection Amer. Mus. Nat. Hist.

[2] Collection Field Mus. Nat. Hist.

[3] Collection Mus. Comp. Zool.

[4] One in collection Mus. Comp. Zool.

Specimens examined.—Total number, 20, as follows:

Guerrero: Balsas, 1;[1] Tlalixtaquilla, 1.
Morelos: Cuernavaca, 1; Puente de Ixtle, 6;[2] Yautepec, 5 (type and topotypes).
Oaxaca: Cuicatlan, 2.
Puebla: Piaxtla, 4.

ORYZOMYS COUESI CRINITUS Merriam.

Valley of Mexico Rice Rat.

Oryzomys crinitus Merriam, Proc. Washington Acad. Sci., III, p. 281, July 26, 1901.

Type locality.—Tlalpam, Federal District, Mexico (altitude 7,500 feet).

Type.—No. 50182, ♂ subadult (molars unworn), United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, November 30, 1892.

Geographic distribution.—Known only from type locality, at about 7,500 feet altitude in the Valley of Mexico; Upper Sonoran Zone.

General characters.—A large, moderately dark form with light buffy underparts and heavy dentition. Similar to *O. c. aztecus* and *O. c. albiventer*, but upperparts darker than either and underparts buffy instead of white; differing also in cranial details.

Color.—Very similar to that of *O. c. mexicanus*, but general tone of upperparts slightly darker; underparts light buffy as in some examples of *mexicanus*.

Skull.—Rather large with broad braincase and heavy dentition. Very similar to those of *O. c. aztecus*, *O. c. albiventer*, and *O. c. regillus*, but frontal region usually broader posteriorly; dentition about the same; interparietal rather large.

Measurements.—Type: Total length, 307; tail vertebræ, 161; hind foot, 37. Adult topotype: 280; 148; 35. *Skull* (type): Greatest length, 32.4; zygomatic breadth, 17; interorbital breadth, 5; width of braincase, 12.3; nasals, 12.4; anterior palatine foramina, 6.7; palatal bridge, 5.7; upper molar series, 4.9.

Remarks.—In the vicinity of marshes along the southern border of the Valley of Mexico, *O. c. crinitus* occurs at about 7,500 feet, the highest altitude attained by any known member of the *O. couesi* section of the genus. The exact relationship of this form to *O. fulgens* remains to be determined, since it possesses some of the characters ascribed to the latter species, the exact habitat of which is unknown. It is closely allied to the other forms inhabiting river valleys of the plateau region of Mexico—*O. c. aztecus*, *O. c. albiventer*, and *O. c. regillus*.

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[1] Collection Field Mus. Nat. Hist.

[2] Three in collection Field Mus. Nat. Hist.

Specimens examined.—Three, from type locality.

ORYZOMYS COUESI REGILLUS Goldman.

Michoacan Rice Rat.

(Pl. I, figs. 4, 4a.)

Oryzomys couesi regillus Goldman, Proc. Biol. Soc. Washington, XXVIII, p. 129, June 29, 1915.

Type locality.—Los Reyes, Michoacan, Mexico.

Type.—No. 125945, ♂ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, February 17, 1903.

Geographic distribution.—Plateau region of northwestern Michoacan, Mexico; altitudinal range from about 3,000 to 4,000 feet, mainly in Arid Lower Tropical Zone.

General characters.—A large form closely allied to *O. c. albiventer;* upperparts darker, more rufescent in color. Similar in general to *O. c. mexicanus*, but larger and richer colored; cranial details also distinctive.

Color.—Much as in *O. c. mexicanus* and *O. c. albiventer* but upperparts darker and more rufescent, the general tone rich ochraceous-buff, the back and rump strongly suffused with tawny and lined with black hairs as usual in the group; underparts varying from nearly pure white to light buff.

Skull.—Like that of *O. c. albiventer;* similar to those of *O. c. mexicanus* and *O. c. couesi*, but larger, with broader braincase and heavier dentition.

Measurements.—Type: Total length, 305; tail vertebræ, 169; hind foot, 36. Average of three adult topotypes: 308 (285–320); 168 (155–180); 35 (34–36). *Skull* (average of 4 adults—type and 3 topotypes): Greatest length, 33.1 (32.5–33.5); zygomatic breadth, 18.1 (17.5–18.5); interorbital breadth, 4.9 (4.6–5.3); width of braincase, 12.5 (12.4–12.5); nasals, 12.9 (12.5–13.3); anterior palatine foramina, 6.2 (6–6.5); palatal bridge, 6.5 (6.4–6.6); upper molar series, 5.1 (4.9–5.3).

Remarks.—This handsome rice rat differs only in color from its near geographic neighbor, *O. c. albiventer*, and the two doubtless intergrade in northern Michoacan.

Specimens examined.—Total number, 13, as follows:

Michoacan: Los Reyes, 11 (type and topotypes); Querendaro, 1; Zamora, 1.

ORYZOMYS COUESI ALBIVENTER Merriam.

White-Bellied Rice Rat.

Oryzomys albiventer Merriam, Proc. Washington Acad. Sci., III, p. 279, July 26, 1901.
Oryzomys molestus Elliot, Field Columb. Mus., publ. 71, zool. ser., III, p. 145, February, 1903. Type from Ocotlan, Jalisco, Mexico (altitude 5,000 feet). No. 8667, ♂ old, Field Mus. Nat. Hist.; collected by F. E. Lutz, June, 1901.

Type locality.—Ameca, Jalisco, Mexico (altitude 4,000 feet).

Type.—No. 82236, ♂ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, February 6, 1897.

Geographic distribution.—River valleys of the plateau region in central Jalisco, Mexico; altitudinal range from about 4,000 to 5,000 feet mainly in Lower Sonoran Zone.

General characters.—Color about as in *O. c. mexicanus*, but size usually larger and cranial details distinctive. Similar in size and proportions to *O. c. regillus* and *O. c. crinitus*, but paler than either, the upperparts lacking the rich rufescent tone of the former, and the underparts normally white instead of buffy as in the latter.

Color.—About as in *O. c. mexicanus*, underparts normally white, but varying to pale, creamy buff.

Skull.—About like that of *O. c. regillus;* similar to that of *O. c. crinitus*, but frontal region usually narrower posteriorly. Compared with those of *O. c. couesi* and *O. c. mexicanus* the skull is decidedly broader, with heavier dentition.

Measurements.—Type: Total length, 288; tail vertebræ, 153; hind foot, 37.5. Average of 10 adults (type and 9 topotypes): 294 (276–314); 161 (151–173); 36.6 (34–40). *Skull* (average of 10 adults—type and 9 topotypes): Greatest length, 33.1 (31.5–34.4); zygomatic breadth, 17.9 (17.3–18); interorbital breadth, 4.8 (4.1–5.2); width of braincase, 12.3 (11.5–12.8); nasals, 13 (12.3–14.2); anterior palatine foramina, 6.3 (5.9–6.6); palatal bridge, 6.3 (5.8–6.7); upper molar series, 5.3 (5–5.5).

Remarks.—While *O. c. albiventer* is usually larger in general size, with broader skull and decidedly larger molar teeth than *O. c. mexicanus*, occasional examples of the two forms are difficult to distinguish and point to probable intergradation in western Jalisco. "*Oryzomys molestus*" of Elliot is based on an unusually large old adult which is clearly referable to *albiventer*, as are four examples in the Biological Survey collection from the same locality.

Specimens examined.—Total number, 18, as follows:

Jalisco: Ameca, 12 (type and topotypes); La Barca, 1; Ocotlan, 5 (including type of "*molestus*.")[1]

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[1] Collection Field Mus. Nat. Hist.

ORYZOMYS COUESI PERAGRUS Merriam.

Rio Verde Rice Rat.

Oryzomys mexicanus peragrus Merriam, Proc. Washington Acad. Sci., III, p. 283, July 26, 1901.

Type locality.—Rio Verde, San Luis Potosi, Mexico.

Type.—No. 82119, ♂ subadult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, January 8, 1897.

Geographic distribution.—Known only from type locality, at about 3,000 feet altitude on the Rio Verde River, in southern San Luis Potosi; Lower Sonoran Zone.

General characters.—Closely allied to *O. c. couesi* but slightly larger, with upperparts more pinkish instead of ochraceous-buffy in general tone; skull more massive. Similar to *O. c. aquaticus* but upperparts usually darker, the ground color less ochraceous-buffy and the dorsal area more heavily lined with black.

Color.—Similar to that of *O. c. couesi* but upperparts paler, less ochraceous-buffy, the cheeks, shoulders, and sides near pinkish buff; lips and chin whitish.

Skull.—About like that of *O. c. aquaticus;* larger and more massive than that of *O. c. couesi,* with broader braincase and broader interorbital space.

Measurements.—Type: Total length, 294; tail vertebræ, 167; hind foot, 35. Average of 2 adult topotypes: 274 (265–283); 151 (143–160); 33.5 (33–34). *Skull* (average of 3 adults—type and 2 topotypes): Greatest length, 31.5 (31–32.2); zygomatic breadth, 16.6 (16.1–17.1); interorbital breadth, 5.5 (5.4–6.2); width of braincase, 12.1 (12–12.3); nasals, 12.1 (11.8–12.5); anterior palatine foramina, 5.8 (5.7–5.8); palatal bridge, 5.9 (5.7–6.2); upper molar series, 4.9 (4.7–5).

Remarks.—As nearly as can be determined by the three known specimens, all young adults, *O. c. peragrus* is somewhat intermediate in characters, as well as geographic position, between *O. c. couesi* and *O. c. aquaticus.* It differs in color from both, but in cranial details approaches the latter form.

Specimens examined.—Three, from type locality.

ORYZOMYS COUESI AQUATICUS Allen.

Rio Grande Rice Rat.

(Pl. I, figs. 5, 5a.)

Oryzomys aquaticus Allen, Bull. Amer. Mus. Nat. Hist., III, p. 289, June 30, 1891.

Type locality.—Brownsville, Cameron County, Texas.

Type.—No. $\frac{3411}{2684}$, ♂ adult, American Museum of Natural History; collected by F. B. Armstrong, March 6, 1891.

Geographic distribution.—Rio Grande Valley, from Camargo, Tamaulipas, to Gulf coast near Brownsville, Texas; altitudinal range from sea level to about 300 feet in lower Sonoran Zone.

General characters.—Size large; closely resembling *O. c. peragrus* but upperparts usually paler, less pinkish, more ochraceous-buffy; underparts buffy, as in *peragrus.* Similar in general to *O. c. couesi* but larger; general color above paler ochraceous-buff; skull relatively broader and more massive.

Color.—*Fresh pelage:* Upperparts near ochraceous-buff, palest on cheeks, shoulders, and along sides; the face, top of head, and back obscured by dusky hairs; underparts varying from light buff to warm buff, becoming in some specimens more or less distinctly whitish on lips, chin, and throat; feet whitish; tail brownish above, pale yellowish below, becoming pale brownish toward tip. *Young* (in first pelage): Upperparts near tawny-olive; underparts with a pale buffy wash, the plumbeous basal color of the fur showing through.

Skull.—About like that of *O. c. peragrus;* decidedly larger and heavier throughout than that of *O. c. couesi,* with broader braincase and more widely spreading zygomata; ascending branches of premaxillæ exhibiting a tendency to exceed nasals in posterior extent (nasals usually exceeding premaxillæ in forms of *O. couesi*).

Measurements.—Type: Total length, 286; tail vertebræ, 140; hind foot, 31.2 (dry skin). Average of 5 adult topotypes: 297 (283–310); 161 (138–180); 34.5 (32–38). *Skull* (average of same): Greatest length, 33 (32–35.4); zygomatic breadth, 18 (16.7–18.8); interorbital breadth, 5 (4.7–5.2); width of braincase, 12 (11.6–12.7); nasals, 12.7 (11.6–13.8); anterior palatine foramina, 6.3 (6.1–6.6); palatal bridge, 6 (5.4–6.6); upper molar series, 5.1 (4.8–5.3).

Remarks.—The Rio Grande Valley, inhabited by *O. c. aquaticus,* marks the extreme northern limit of the general range of the *O. couesi* series. No rice rats are yet known from the interval of coastal plain in Tamaulipas, but close resemblance in all essential respects points to intergradation through *O. c. peragrus* with typical *couesi.* In general size and contour the skull of aquaticus is not widely different from those of *O. c. albiventer, O. c. regillus,* and *O. c. crinitus* of the Mexican plateau region, but it maintains the lighter dentition of typical *couesi.*

Specimens examined.—Total number, 41, as follows:

Texas: Brownsville, 37 (type and topotypes);[1] Lomita Ranch (Hidalgo County), 1.
Tamaulipas: Camargo, 1; Matamoros, 2.

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[1] Fourteen in Amer. Mus. Nat. Hist.; 3 in Kansas Univ. Mus.; 2 in Field Mus. Nat. Hist.; 2 in Mus. Comp. Zool.; 2 in Acad. Nat. Sci. Philadelphia.

ORYZOMYS FULGENS Thomas.

Thomas Rice Rat.

Oryzomys fulgens Thomas, Ann. Mag. Nat. Hist., ser. 6, XI, p. 403, May, 1893.

Type locality.—"Mexico." Southern Mexico, exact locality unknown (probably in or near Valley of Mexico).

Type.—70.6.20.3, ♂ adult, British Museum; purchased of Geale, collected by A. Boucard.

Geographic distribution.—Range unknown.

General characters.—From original description: "Size large. Fur very thick, coarse and woolly. General colour above bright fulvous, brighter than in any other Central-American species; anterior half of the body, including the head, rather paler and duller than the posterior half. Ears decidedly small, broadly rounded, thinly haired, their hairs practically the same colour as those of the head in general, so that they are not distinguishable by colour at a distance. Lips, chin, throat, and inguinal region whitish, belly with a strong suffusion of fawn, which reaches a maximum on the breast between the fore legs; passage of upper colour into lower quite gradual. Outer sides of limbs like back, inner sides whitish; upper surfaces of hands and feet thinly clothed with pale silvery-fawn hairs. Tail long, thinly haired, the scales not hidden by the hairs; above blackish, below yellowish, darkening towards the tip."

Skull.—From original description: "Skull readily distinguishable from all allied species by its great breadth, the bold expansion of the zygomata, and especially by the evenly incurved outline of the supraorbital edges; in all other species these edges form two approximately straight lines diverging from the narrowest interorbital point, but in *O. fulgens* the whole inner wall of the orbit forms one even curve, the breadth at the posterior end of the olfactory chamber being scarcely greater than at the anterior end. Nasals broad and flattened. Frontal premaxillary processes very narrow and barely attaining to the same level as the back of the nasals. Anterior palatine foramina large, widely open, their posterior margin just level with the front of *m1*."

Measurements.—Dry skin of type (from original description): Head and body, 160; tail, 151; hind foot, 37.5 (c. u.). *Skull* (type): Upper length,[1] 31.8; zygomatic breadth, 17.8 (c.); nasals, 13.2; interorbital breadth, 4.8; diastema, 9.1; anterior palatine foramina, 7.2; upper molar series, 5.2.

Remarks.—The type of *O. fulgens* I have been unable to examine, and none of the more recently accumulated material from Mexico can at present be assigned with certainty to that species. Thomas's full description, above quoted, and comparisons kindly made for me by W. H. Osgood, however, seem to indicate that this is a member of the widely dispersed *O. couesi* section of the genus. Some of the characters given are shared in common by various forms now recognized. In size and color arrangement it closely approaches *O. c. crinitus*, of the Valley of Mexico, and may be identical with that form, but the intensity of color and details presented by the incomplete skull, especially the form of the interorbital region, appear to be distinctive and the exact position of *fulgens* remains to be determined.

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[1] To back of parietal suture only.

ORYZOMYS GATUNENSIS Goldman.

Gatun Rice Rat.

(Pl. I, figs. 6, 6a.)

Oryzomys gatunensis Goldman, Smiths. Misc. Coll., LVI, no. 36, p. 7, February 19, 1912.

Type locality.—Gatun, Canal Zone, Panama.

Type.—No. 171034, ♂ young (about two-thirds grown), United States National Museum (Biological Survey collection); collected by E. A. Goldman March 7, 1911.

Geographic distribution.—Known only from type locality, near sea level; Humid Lower Tropical Zone.

General characters.—A dark-colored form externally similar to *O. c. richmondi*, but with distinctive cranial characters.

Color.—*Fresh pelage:* Upperparts near ochraceous-tawny, palest on cheeks, shoulders, and along sides; the face, top of head, and back much darker by admixture of black hairs; underparts light ochraceous-buffy; outer sides of ears blackish, the inner sides clothed with ochraceous-buffy hairs; feet thinly covered with very short whitish or grayish hairs; tail light brownish above, somewhat paler below.

Skull.—Similar in general to that of *O. c. richmondi*, but frontal region broader, the lateral margins more developed as supraorbital shelves; interparietal much less extended antero-posteriorly; nasals more prolonged posteriorly beyond premaxillæ; dentition about as in *richmondi*.

Measurements.—Type: Total length, 224; tail vertebræ, 115; hind foot, 31.5. *Skull* (type): Greatest length, 27.7; zygomatic breadth, 14.5; interorbital breadth, 5.3; width of braincase, 11.4; nasals, 10.2; anterior palatine foramina, 5.6; palatal bridge, 5.2; upper molar series, 5.

Remarks.—This species requires comparison with only *O. c. richmondi*, with which it is nearly identical in color and general external appearance. The skull, however, differs in apparently important respects from those of all the forms of *O. couesi*. Especially noticeable is the lateral development of the supraorbital ridges, a character which in fully adult examples would doubtless be more pronounced; the reduced antero-posterior extent of the interparietal seems to be another distinguishing feature. On the other hand the material representing *O. gatunensis* is scanty and the range of individual variation being undetermined, intergradation with *couesi* and *richmondi* in Costa Rica or western Panama seems not improbable.

Specimens examined.—Two, from type locality.

ORYZOMYS COZUMELÆ Merriam.

Cozumel Rice Rat.

(Pl. I, figs. 7, 7a.)

Oryzomys cozumelæ Merriam, Proc. Washington Acad. Sci., III, p. 280, July 26, 1901.

Type locality.—Cozumel Island, off east coast of Quintana Roo, Mexico.

Type.—No. 108462, ♂ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, April 8, 1901.

Geographic distribution.—Known only from type locality.

General characters.—Size large; tail much longer than head and body; color dark. A large species allied to *O. c. couesi* of the neighboring mainland, differing in larger size, darker color, and proportionately longer tail.

Color.—*Worn pelage:* Upperparts between ochraceous-tawny and cinnamon-brownish, palest on cheeks, shoulders, and sides, darkened on face, top of head, and back by a brownish admixture; underparts between light buff and light ochraceous-buff; feet whitish; tail dark brownish above, dull yellowish below basally, becoming dusky all around toward tip.

Skull.—In general outline closely resembling that of *O. c. couesi* but larger and more massive; rostrum and anterior roots of zygomata relatively slightly heavier; dentition about as in *couesi*.

Measurements.—Type: Total length, 332; tail vertebræ, 182; hind foot, 35. Average of 6 adult topotypes: 306 (285–327); 172 (163–177); 34.3 (33–35.5). *Skull* (average of 6 adults—type and 5 topotypes): Greatest length, 32 (30.5–34.4); zygomatic breadth, 16.9 (15.9–17.9); interorbital breadth, 5 (4.7–5.6); width of braincase, 12.1 (11.5–12.6); nasals, 12.5 (11.7–13.6); anterior palatine foramina, 6.3 (6.2–6.7); palatal bridge, 5.8 (5.7–6.1); upper molar series, 5 (4.8–5.3).

Remarks.—This insular species is clearly an offshoot of *O. couesi*, the widely ranging mainland form. Its divergence from typical *couesi* is mainly in the direction of larger general size and the development of a relatively longer tail.

Specimens examined.—Nine, from type locality.

ORYZOMYS ANTILLARUM Thomas.

Jamaican Rice Rat.

Oryzomys antillarum Thomas, Ann. Mag. Nat. Hist., ser. 7, I, p. 177, February, 1898.

Type locality.—Jamaica.

Type.—No. 45.10.25.48, British Museum; collected by P. H. Gosse.

Geographic distribution.—Known only from Jamaica.

General characters.—Allied to *O. couesi;* size and proportions about as in the typical subspecies; color apparently similar; skull differing in rather slight details.

Color.—From original description of type: "General colour dull rufous, rather (though not prominently) richer on the rump and greyer on the head; black lining of back not prominently marked. Belly dull yellowish, not sharply defined, the hairs slaty grey basally. No blackish ring round eyes. Ears small, their visible external surface blackish and internal yellowish, but in neither case very strongly contrasting with the general colour. Hands and feet dull whitish above. Tail apparently about as long as head and body, very thinly haired, almost naked, pale brownish above, rather lighter below." Two specimens in the United States National Museum, collected many years ago, are very tawny above, but appear to have been immersed in alcohol, and the naturally ruddy tone thereby intensified.

Skull.—Closely resembling that of *O. c. couesi*, but nasals reaching farther posteriorly beyond premaxillæ (nasals and premaxillæ more nearly conterminous in *couesi*); maxillary arm of zygoma heavier; anterior palatine foramina shorter than usual in *couesi;* dentition about the same.

Measurements.—From original description of type (measured in skin): "Head and body (apparently stretched) 130 millim.; tail (imperfect at tip) 130; hind foot without claws (moistened), 28." * * * Skull (type): "Basal length (c.) 26, basilar length (c.) 24; greatest breadth 17; nasals 12.6 x 4.1; interorbital breadth 5.2; breadth of braincase on squamosals 12.9; interparietal 2.8 x 8.5; palate length from henselion 14; diastema 8.3; palatal foramina 5.7 x 2.1; length of upper molar series 4.6". An adult from Metcalfe Parish (dry skin): Total length, 252; tail vertebræ, 122; hind foot (c. u.), 29.2. *Skull* (of same): Greatest length, 30.5; zygomatic breadth, 16.6; interorbital breadth, 5.1; width of braincase, 12.2; nasals, 12.6; anterior palatine foramina, 5.7; upper molar series, 4.5.

Remarks.—The relationship of the Jamaican rice rat to *O. couesi* was pointed out by Thomas in his original account of the species. In view of its isolation, the general agreement in all the more important respects, even to size, a character usually subject to modification in insular forms, is remarkable, and suggests the possibility that *O. antil-*

larum may have been transported from some point on the coast of the North American mainland within a comparatively recent period. As suggested by Thomas, however, the fact that no specimens appear to have been taken since 1877, while rats of the Old World have devastated the island, to be persecuted in their turn by the mongoose, introduced in 1872, renders it probable that the rice rat has been exterminated there.

Specimens examined.—Total number, 2, as follows:

Jamaica: Metcalfe Parish, 1; Spanishtown, 1.

ORYZOMYS PENINSULÆ Thomas.

Lower California Rice Rat.

(Pl. I, figs. 8, 8a.)

Oryzomys peninsulæ Thomas, Ann. Mag. Nat. Hist., ser. 6, XX, p. 548, December, 1897.

Type locality.—Santa Anita, Lower California, Mexico.

Type.—Male adult, British Museum.

Geographic distribution.—Known only from very limited marshy areas near sea level in extreme southern Lower California; Arid Lower Tropical Zone.

General characters.—General size and proportions about as in *O. c. mexicanus;* color similar, but anterior part of body, especially head and shoulders, strongly suffused with gray; skull rather broad, with squarely spreading zygomata and large interparietal.

Color.—*Fresh pelage:* Upperparts between warm buff and pale ochraceous-buff (more or less distinctly tawny in worn pelage of old adults) most intense on rump, becoming light buffy grayish on head, fore limbs, shoulders, and sides; underparts overlaid with white, the basal color of the fur usually plumbeous, except on chin and throat, where it is pure white to roots; outer sides of ears brownish, inner sides clothed with grayish or ochraceous-buffy hairs; feet white; tail light brownish above, yellowish below, becoming more or less distinctly brownish toward tip. *Young* (in first pelage): Upperparts more fuscous, the head and shoulders lacking the grayish suffusion so noticeable in adults; underparts dull buffy or soiled white, becoming pure white on chin and throat.

Skull.—Similar to that of *O. c. mexicanus*, but broader; zygomata more widely and squarely spreading; braincase less flattened, higher, more rounded or inflated; interparietal larger; anterior palatine foramina much broader, more widely open; lateral wings of parietals extending farther below temporal ridges at expense of squamosals; ascending branches of premaxillæ usually reaching posteriorly beyond nasals (nasals usually exceeding premaxillæ in posterior extent in *mexicanus*).

Measurements.—Average of nine adults from San Jose del Cabo, Lower California (near type locality): Total length, 283 (270–305); tail vertebræ, 143 (138–156); hind foot, 32.2 (31.5–34). *Skull* (average of eight adults from San Jose del Cabo, Lower California): Greatest length, 32.5 (31.5–33.9); zygomatic breadth, 17.9 (17.1–19); interorbital breadth, 5.1 (4.9–5.3); width of braincase, 12 (11.4–12.2); nasals, 13 (12.6–13.4); anterior palatine foramina, 6.6 (6.2–7.4); palatal bridge, 6.2 (6–6.4); upper molar series, 4.8 (4.7–5.1).

Remarks.—*O. peninsulæ* is allied to *O. c. mexicanus* of the adjacent mainland coast of Mexico, but important differential cranial characters are numerous. The range of the species seems to be centered in the marshes near the mouth of the San Jose River at San Jose del Cabo, extending a few miles inland along the course of the stream. The neighboring coast is extremely arid and unsuitable for habitation by an *Oryzomys*.

Specimens examined.—Total number, 16, as follows:

Lower California: San Jose del Cabo, 15; Santa Anita, 1 (topotype).

ORYZOMYS NELSONI Merriam.

Nelson Rice Rat.

(Pl. II, figs. 1, 1a.)

Oryzomys nelsoni Merriam, Proc. Biol. Soc. Washington, XII, p. 15, January 27, 1898.

Type locality.—Maria Madre Island, Tres Marias Islands, off coast of Tepic, western Mexico (altitude 800 feet).

Type.—No. 89200, ♂ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, May 13, 1897.

Geographic distribution.—Known only from type locality, Maria Madre Island, where it inhabits moist places on the upper slopes at about 800 feet altitude; Arid Lower Tropical Zone.

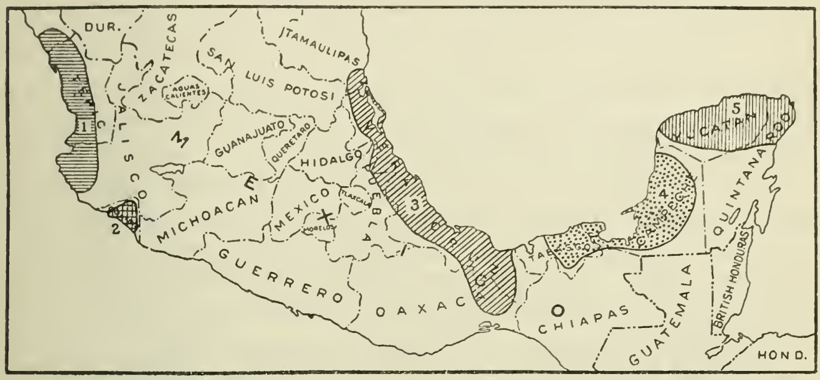
General characters.—Size very large; tail much longer than head and body; color of upper parts rich ochraceous-buff; skull rather long and narrow, but massive. Allied to *O. c. mexicanus*, but differing widely in details of structure.

Color.—*Fresh pelage:* Upperparts rich ochraceous-buff, most intense on rump, paling to warm buff on head, shoulders, and lower parts of sides; somewhat darkened on face, top of head, and back by dusky hairs; underparts white; outer and inner sides of ears thinly clothed with grayish hairs; tail light brownish above and all round near tip, becoming yellowish below on basal portion.

Skull.—Massive, upper outline rising high over anterior roots of zygomata, the rostrum very heavy and strongly decurved. Somewhat similar in general to that of *O. c. mexicanus*, but much larger and heavier; rostrum much more swollen and decurved; zygomata heavier, but relatively less widely spreading, the sides more nearly parallel; supraorbital ridges less divergent posteriorly; interparietal larger; anterior palatine foramina relatively shorter; dentition about as in *mexicanus*.

Measurements.—Type: Total length, 324; tail vertebræ, 190; hind foot, 38. Two adult topotypes: 344, 320; 191, 185; 39, 37. *Skull* (average of 3 adults—type and 2 topotypes): Greatest length, 35.8 (34.5–37.8); zygomatic breadth, 18.7 (18.2–19); interorbital breadth, 5.4 (5.2–5.6); width of braincase, 12.9 (12.8–13. 1); nasals, 14.5 (14.2–14.8); anterior palatine foramina, 6.3 (6.1–6.7); palatal bridge, 6.9 (6.6–7.3); upper molar series, 5.3 (5.1–5.4).

Remarks.—The isolation of *O. nelsoni* on an island 70 miles off the mainland coast has resulted in the evolution of a well-marked species, but agreement in essential characters with forms of *O. couesi* places it in that widely distributed section of the genus. It differs strikingly from all the mainland forms in the remarkable development of the rostrum.



1. *O. m. melanotis.*
2. *O. m. colimensis.*
3. *O. r. rostratus.*
4. *O. r. megadon.*
5. *O. r. yucatanensis.*

FIG. 4.—Geographic distribution of the *Oryzomys melanotis* group.

Specimens examined.—Four, from type locality.

Oryzomys melanotis Group.

Geographic distribution—Mainly lower elevations near the Pacific coast of Mexico from southern Sinaloa to Colima, and along the gulf coast from southern Tamaulipas to the Yucatan peninsula; altitudinal range from sea level to about 3,000 feet; Arid and Humid Lower Tropical Zones (fig. 4).

General characters.—Size small, medium, or large; form rather slender; tail about same length as head and body or somewhat longer, scantily and indistinctly haired; ears large and conspicuous, thinly clothed externally with short, fine dusky hairs and internally with similarly short, rufescent hairs; general pelage short, rather harsh, and lacking the woolly quality of *O. palustris;* vibrissæ about as long as head; toes of hind feet more or less distinctly webbed at base, the three longest bearing tufts of silvery bristles which project beyond ends of claws; claws short, recurved, compressed, and sharp pointed. Color of upperparts varying from ochraceous-buff to rich ochraceous-tawny, lined with black; underparts white or buffy whitish.

Skull.—Size small, medium, or large, with rostrum long and braincase rather narrow; maxillary arm of zygoma heavy; outer wall of antorbital foramen with projecting border rounded or sloping forward, the antorbital fossa deep and conspicuous, but less evenly circular than in *O. palustris* as viewed from above; nasals and premaxillæ about conterminous posteriorly; frontal region wide or narrow, constricted near middle, the lateral margins ridged or smooth; temporal ridges moderately developed anteriorly along parieto-squamosal sutures, becoming indistinct posteriorly in crossing lateral wings of parietals; interparietal large; anterior palatine foramina short and broad, much shorter than palatal bridge, not normally reaching anterior plane of first molars; palatal pits and spheno-palatine vacuities large; interpterygoid fossa broad; audital bullæ small, the inner sides extensively overlapped by mastoids; basi-occipital broad; angle of mandible broad, the inferior border strongly turned inward; coronoid process short and low, owing largely to high, thin commissural border extending to condyle; molars small, approaching the *O. palustris* type but smaller, second upper molar more evenly cleft by inner reentrant angle, and third lower molar more deeply incised by outer reentrant angle. The skulls of *O. melanotis* and its allies differ from those of the *O. palustris* group most noticeably in the elongation of the rostrum, shortness of anterior palatine foramina in relation to palatal bridge, small size of audital bullæ, and the dental details noted.

Remarks.—Unlike *O. palustris* and its allies, which live on the ground mainly in open marshy places or resort to the vicinity of water, members of this group favor more forested areas, where they are partially scansorial in habits, and occur on well-drained but moist mountain slopes sometimes at points distant from water.

In external appearance, forms of the *O. melanotis* group superficially resemble those of *O. couesi*, and the two often occur together at the same localities. In contrast with *O. couesi*, however, the upperparts are usually more rufescent, the ears are much larger, less conspicuously hairy, and tufts of silvery bristles project beyond the points of the three longer claws on the hind foot (claws reaching beyond bristles in *couesi*).

Key to Species and Subspecies of the O. melanotis Group.

a^1. Size larger; hind foot 30 or more. (Atlantic coast of Mexico [*O. rostratus*].)
  b^1. Upper molar series 4 or more.
    c^1. Color darker. (Tabasco; Campeche.)................ **O. r. megadon** (p. 54).
    c^2. Color paler. (Southern Tamaulipas; Vera Cruz; northern Puebla; northeastern Oaxaca.)................................ **O. r. rostratus** (p. 53).
  b^2. Upper molar series less than 4. (Yucatan.)........**O. r. yucatanensis** (p. 55).
a^2. Size smaller; hind foot less than 30. (Pacific coast of Mexico [*O. melanotis*].)
  b^1. Color darker. (Sinaloa; Tepic; Jalisco.)............ **O. m. melanotis** (p. 50).
  b^2. Color paler. (Colima.)........................... **O. m. colimensis** (p 51).

ORYZOMYS MELANOTIS Thomas.

[Synonymy under subspecies.]

Geographic distribution.—Pacific coastal plains and basal mountain slopes from southern Sinaloa south through western Tepic and Jalisco to Colima; altitudinal range from sea level to 3,000 feet; Arid Lower Tropical Zone.

General characters.—Size small or medium; general color above varying from rich ochraceous-buffy to pale ochraceous-tawny; similar to small forms of *O. rostratus* in general external appearance but skull differing in important details.

Color.—*Fresh pelage:* Upperparts varying from ochraceous-buff to pale ochraceous-tawny (sometimes becoming intense tawny or rusty reddish in the worn pelage of old adults), rather sparingly lined with black hairs, which becoming less numerous along cheeks and sides, leave them a purer, brighter color than the back; underparts pale buffy white, the dark basal color of the fur showing through; outer sides of ears blackish, the inner sides thinly clothed with rusty reddish hairs; a more or less conspicuous patch of light-colored fur under base of ear; feet (epidermis) dull yellowish, thinly covered above with short white hairs; tail (epidermis) brownish above, becoming light brownish or dull yellowish below except near lip, which is usually dark all around. *Young* (in first pelage): Upperparts duller and darker, the general tone browner than in adults.

Skull.—Similar in general to that of *O. rostratus*, but upper outline less elevated over anterior part of frontals; braincase relatively higher, the parietal region more expanded; rostrum more slender, less decurved; frontals broader, with narrow and delicate but rather well-developed supraorbital borders; parietals more squarely truncate anteriorly, the fronto-parietal sutures more widely divergent; temporal ridges tending to spread more widely posteriorly, rejoining squamosals after crossing slightly developed lateral wings of parietals; interparietal larger, with a less evident posterior angle; outer wall of antorbital foramen narrower, less extended anteriorly; anterior palatine foramina short and wide as in *rostratus;* dentition about the same.

Remarks.—Two closely allied geographic races of *O. melanotis* occupy a part of the arid coast region of western Mexico, where they appear to be completely isolated from their relatives (subspecies of *O. rostratus*) along the Gulf coast of eastern Mexico. The not very distant relationship of *O. melanotis* to *O. rostratus* is evidenced in numerous characters, but the two species appear to be distinct. In general external appearance, including color, they are much alike; in fresh pelage *O. melanotis* may usually be distinguished by the whitish subauricular spots; the skulls are easily separable by the characters pointed out.

ORYZOMYS MELANOTIS MELANOTIS Thomas.

Jalisco Rice Rat.

(Pl. II, figs. 2, 2a; Pl. V, fig. 5; Pl. VI, figs. 2, 2a.)

Oryzomys melanotis Thomas, Ann. Mag. Nat. Hist., ser. 6, XI, p. 404, May, 1893.

Type locality.—Mineral San Sebastian, Jalisco, Mexico.

Type.—93.3.6.25, ♂ old, British Museum; collected by Dr. Audley C. Buller, January 25, 1893.

Geographic distribution.—Coastal plains and basal mountain slopes in southern Sinaloa, Tepic, and Jalisco; altitudinal range from sea level to about 3,000 feet; Arid Lower Tropical Zone.

General characters.—Size medium; color of upperparts near pale ochraceous-tawny; closely allied to *O. m. colimensis* but larger and darker colored; externally similar to pale examples of *O. rostratus;* skull with long, slender rostrum and high-arched braincase.

Color.—*Fresh pelage:* Upperparts pale ochraceous-tawny (becoming intense tawny or rusty reddish in the worn pelage of old adults), rather sparingly lined with black hairs, which becoming less numerous along cheeks and sides leave them a purer, brighter color than on the back; underparts white or pale buffy white, the dark basal color of the fur showing through; outer sides of ears blackish, inner sides thinly clothed with rusty reddish hairs; a more or less conspicuous patch of whitish fur under base of ear; feet whitish; tail brownish above, becoming light brownish or yellowish below except near tip, which is usually dark all around. *Young* (in first pelage): Upperparts duller and darker, the general tone browner than in adults.

Skull.—Similar to that of *O. m. colimensis,* but larger, with comparatively smaller molar teeth.

Measurements.—Average of five adult topotypes: Total length, 235 (228–244); tail vertebræ, 128 (124–134); hind foot, 28.2 (27.5–29). *Skull* (two adult topotypes): Greatest length, 28.5, 27.9; zygomatic breadth, 14.4, 14.5; interorbital breadth, 4.8, 5.2; width of braincase, 10.8, 10.7; nasals, 11.5, 10.3; anterior palatine foramina, 4.3, 5.2; palatal bridge, 5.4, 5.4; upper molar series, 4, 4.3.

Remarks.—Specimens from localities near sea level in Jalisco and Tepic are larger than those from the type locality at 3,000 feet altitude on the slope of the mountains, and may represent a slightly different form. In size they contrast strongly with the small form *O. m. colimensis* inhabiting the coast of Colima.

Specimens examined.—Total number, 13, as follows:

Jalisco: Ixtapa, 2; San Sebastian, 6 (type and topotypes).
Sinaloa: Los Limones, 1.[1]
Tepic: San Blas, 2; Santiago, 2.

ORYZOMYS MELANOTIS COLIMENSIS, SUBSP. NOV.

COLIMA RICE RAT.

(Pl. II, figs. 3, 3a.)

Type locality.—Armeria, Colima, Mexico (altitude about 100 feet).

Type.—No. $\frac{33289}{45317}$, ♀ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson, March 2, 1892. Original number 1987.

Geographic distribution.—Forested coastal plains and basal mountain slopes in the State of Colima, Mexico ; altitudinal range from sea level to 1,500 feet; Arid Lower Tropical Zone.

General characters.—A small form closely allied to *O. m. melanotis;* differing mainly in smaller size and paler color; general tone of upperparts ochraceous-buff instead of ochraceous-tawny as in *melanotis.*

Color.—Upperparts in general near ochraceous-buff, the top of head and back sparingly mixed with black, giving a lined effect; cheeks, shoulders, and sides paler than back, the general tone light ochraceous-buff; underparts whitish or pale buffy whitish; ears blackish or brownish, thinly clothed on outer sides with short dusky hairs, and on inner sides with buffy or rusty reddish hairs; a patch of whitish fur under base of ear as in *O. m. melanotis;* feet yellowish, thinly covered above with short white hairs; tail brownish above, yellowish below to near tip, which is dusky all around.

Skull.—About like that of *O. m. melanotis,* but smaller; molar teeth actually about the same size as those of *melanotis,* and therefore relatively larger.

Measurements.—Type: Total length, 216; tail vertebræ, 116; hind foot, 26. Adult topotype: 220; 118; 28. *Skull* (average of two adults, type and topotype): Greatest length, 27 (26.3–27.7); zygomatic breadth, 14 (13.9–14.2); interorbital breadth, 4.7 (4.5–4.9); width of braincase, 10.2 (9.9–10.6); nasals, 10.7 (10.3–11.1); anterior palatine foramina, 4.4 (4.3–4.5); palatal bridge, 5.4 (5.4–5.5); upper molar series, 4 (3.9–4.1).

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[1] Collection Amer. Mus. Nat. Hist.

Remarks.—This small form is known only from the State of Colima, but probably ranges to the southward along the coast of Michoacan. An adult example from Hacienda Magdalena is dark in color and in this respect approaches *O. m. melanotis*, but agrees otherwise with the small series of topotypes from near the Pacific coast.

Specimens examined.—Total number, 4, as follows:

Colima: Armeria, 3 (type and topotypes); Hacienda Magdalena, 1.

ORYZOMYS ROSTRATUS Merriam.

[Synonymy under subspecies.]

Geographic distribution.—Coastal plains and basal mountain slopes from extreme southeastern Tamaulipas through northern Puebla, Vera Cruz, northeastern Oaxaca, Tabasco, Campeche, and Yucatan to northern Quintana Roo; altitudinal range from sea level to about 1,500 feet; Arid and Humid Lower Tropical Zones.

General characters.—A rather large, rufescent species, not very unlike *O. melanotis* in external appearance, but cranial characters distinctive. (For additional characters, excepting specific color, see under *O. melanotis* group.)

Color.—Upperparts varying from ochraceous-buff to rich intense ochraceous-tawny, purest and brightest along cheeks and sides; the face, top of head, and back moderately lined with black hairs, which alter the general tone; underparts white or pale buffy white, the plumbeous basal color usually showing through; outer sides of ears blackish, the inner sides thinly and inconspicuously clothed with pale buffy or rusty reddish hairs; feet (epidermis) dull yellowish, thinly covered with short white hairs; tail (epidermis) varying from nearly uniform brownish throughout to irregularly yellowish on under side. *Young* (in first pelage): Upperparts darker and less rufescent than in adults.

Skull.—Similar in general to that of *O. melanotis*, but upper outline more elevated over anterior part of frontals; braincase relatively lower, the parietal region less expanded; rostrum heavier, more decurved; frontals narrower posteriorly; parietals less squarely truncate anteriorly, the fronto-parietal sutures less widely divergent; temporal ridges tending to spread less widely posteriorly; interparietal smaller, with a more evident posterior angle; outer wall of antorbital foramen broader, more extended anteriorly; anterior palatine foramina short and wide as in *melanotis;* dentition about the same.

Remarks.—Three geographic races of *O. rostratus* are recognizable, all of which closely intergrade and differ rather slightly in average size, color, or cranial details. Viewed as a whole, the forms exhibit a progressive decrease in size from west to east, typical *rostratus* being the largest and *O. r. yucatanensis* the smallest of the series.

ORYZOMYS ROSTRATUS ROSTRATUS Merriam.

Metlaltoyuca Rice Rat.

(Pl. II, figs. 4, 4a.)

Oryzomys rostratus Merriam, Proc. Washington Acad. Sci., III, p. 293, July 26, 1901.

Type locality.—Metlaltoyuca, Puebla, Mexico (altitude 800 feet).

Type.—No. 93112, ♂ old, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, February 5, 1898.

Geographic distribution.—Forested coastal plains and basal mountain slopes in southeastern Tamaulipas, northern Puebla, Vera Cruz, and northeastern Oaxaca; altitudinal range from sea level to about 1,500 feet; Arid and Humid Lower Tropical Zones.

General characters.—Similar to *O. r. megadon* and *O. r. yucatanensis*, but averaging larger than either; color rather pale, much as in *yucatanensis*, slightly paler, less rufescent than usual in *megadon;* skull broad.

Color.—*Fresh pelage:* Upperparts rich ochraceous-tawny, purest and brightest along cheeks and sides; the face, top of head, and back moderately lined with black hairs which darken the general tone; underparts nearly pure white in some specimens, pale buffy white in others, the dark basal color, however, usually showing through; outer sides of ears blackish, the inner sides thinly clothed with pale buffy or rusty reddish hairs; feet (epidermis) dull yellowish, thinly covered with short white hairs; tail varying from nearly uniform brownish throughout to irregularly yellowish on under side.

Skull.—Closely resembling those of *O. r. megadon* and *O. r. yucatanensis* in general form, but larger and relatively broader than either, the greater breadth most conspicuous in the braincase; dentition about as in *megadon*, decidedly heavier than in *yucatanensis*. Similar to that of *O. talamancæ*, but narrower; zygomata less squarely spreading, the sides more divergent anteriorly; frontal region narrower, the supraorbital ridges weakly developed; parietals with lateral wings less developed below temporal ridges; interparietal smaller. Contrasted with that of *O. melanotis*, the skull is larger, the upper outline more arched over anterior part of frontals; braincase relatively lower and flatter; frontals relatively narrower posteriorly; interparietal smaller.

Measurements.—Type: Total length, 277; tail vertebræ, 141; hind foot, 32.5. Average of seven adult topotypes: 255 (240–270); 136 (125–145); 31.9 (30–33). *Skull* (average of 7 adults—type and 6 topotypes): Greatest length, 31.4 (30.8–33.3); zygomatic breadth, 16.1 (15.4–17.4); interorbital breadth, 5 (4.6–5.2); width of braincase, 11.5 (11.4–11.7); nasals, 12.8 (11.5–13.8); anterior palatine foramina, 5.2 (4.4–6); palatal bridge, 6.6 (6.3–7.3); upper molar series, 4.3 (4.1–4.4).

Remarks.—While *O. r. rostratus* is distinguished by somewhat larger general size, and the greater breadth of the braincase is an especially noticeable cranial feature, the wide range of individual variation shown in large series of specimens renders the smaller examples difficult to separate from some of those of *O. r. megadon*. Specimens from Pasa Nueva and Achotal, Vera Cruz, are rather small and grade toward *megadon*. Those from Alta Mira, Tamaulipas, marking the extreme northern limit of the known range of *rostratus*, average slightly paler than typical examples.

Specimens examined.—Total number, 48, as follows:

Oaxaca: Santo Domingo (mountains near), 5.
Puebla: Metlaltoyuca 14 (type and topotypes).
Tamaulipas: Alta Mira, 5.
Vera Cruz: Achotal, 8;[1] Motzorongo, 1; Pasa Nueva, 6;[2] San Carlos, 9.[1]

ORYZOMYS ROSTRATUS MEGADON Merriam.

Tabasco Rice Rat.

(Pl. II, figs. 5, 5a.)

Oryzomys rostratus megadon Merriam, Proc. Washington Acad. Sci., III, p. 294, July 26, 1901.

Type locality.—Teapa, Tabasco, Mexico.

Type.—No. 99978, ♂ old, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, March 24, 1900.

Geographic distribution.—Heavily forested coastal plains and lower mountain slopes in Tabasco and Campeche; altitudinal range from sea level to at least 500 feet; Humid Lower Tropical Zone.

General characters.—Closely resembling *O. r. rostratus* and *O. r. yucatanensis*, but color slightly richer, more tawny than either; skull smaller than that of *rostratus* and larger than that of *yucatanensis*.

Color.—About like that of *O. r. rostratus*, but slightly darker and richer, more intense ochraceous-tawny.

Skull.—Similar to that of *O. r. rostratus*, but smaller and narrower; differing from that of *O. r. yucatanensis* mainly in larger size and heavier dentition.

Measurements.—Type: Total length, 272; tail vertebræ, 140; hind foot 32.5. Average of 2 adult topotypes: 236.5 (236–237); 121 (120–122); 30 (29–31). *Skull* (average of 3 adults—type and 2 topotypes): Greatest length, 30.5 (29.1–32.3); zygomatic breadth, 15.6 (15–16.5); interorbital breadth, 4.6 (4.4–4.9); width of braincase, 10.6 (10.5–10.7); nasals, 11.5 (11.3–12); anterior palatine foramina, 4.9 (4.6–5.1); palatal bridge, 6.3 (6–6.8); upper molar series, 4.3 (4.1–4.6).

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[1] Collection Field Mus. Nat. Hist.

[2] Collection Amer. Mus. Nat. Hist.

Remarks.—*O. r. megadon* appears to be a rather localized form. A series of specimens from Apazote, Campeche, agree most closely, as a whole, with typical *megadon*, but some are rather pale in color, and in the reduced size of molar teeth also approach *O. r. yucatanensis*.

Specimens examined.—Total number, 18, as follows:

Campeche: Apazote, 11; Champoton, 1.
Tabasco: Teapa 6 (type and topotypes).

ORYZOMYS ROSTRATUS YUCATANENSIS Merriam.

Yucatan Rice Rat.

(Pl. II, figs. 6, 6a.)

Oryzomys yucatanensis Merriam, Proc. Washington Acad. Sci., III, p. 294, July 26, 1901.

Type locality.—Chichen Itza, Yucatan, Mexico.

Type.—No. 108139, ♂ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, February 9, 1901.

Geographic distribution.—Forested lowlands of Yucatan and northern Quintana Roo; mainly Arid Lower Tropical Zone.

General characters.—Similar to *O. r. rostratus* and *O. r. megadon* but somewhat smaller than either; skull small, with very small molar teeth.

Color.—Much as in *O. r. rostratus* but decidedly paler, the general tone ochraceous-buff instead of rich ochraceous-tawny.

Skull.—Most closely resembling that of *O. r. megadon*, but smaller, with short anterior palatine foramina and decidedly smaller molar teeth.

Measurements.—Type: Total length, 235; tail vertebræ, 119; hind foot, 32. Adult from Puerto Morelos, Quintana Roo, 255; 136; 31. *Skull* (type): Greatest length, 28.7; zygomatic breadth, 15; interorbital breadth, 4.6; width of braincase, 10.8; nasals, 11.8; anterior palatine foramina, 4.2; palatal bridge, 5.9; upper molar series, 3.7.

Remarks.—This rather small pale form of *O. rostratus* apparently passes into *O. r. megadon* in southern Campeche. The specimens from Apazote are referred to *megadon*, with which the majority agree most closely, but several are indistinguishable in color from *O. r. yucatanensis*, and, as they present no wide departure in cranial details, might be assigned to that form but for the presence of the larger or darker examples in the same series.

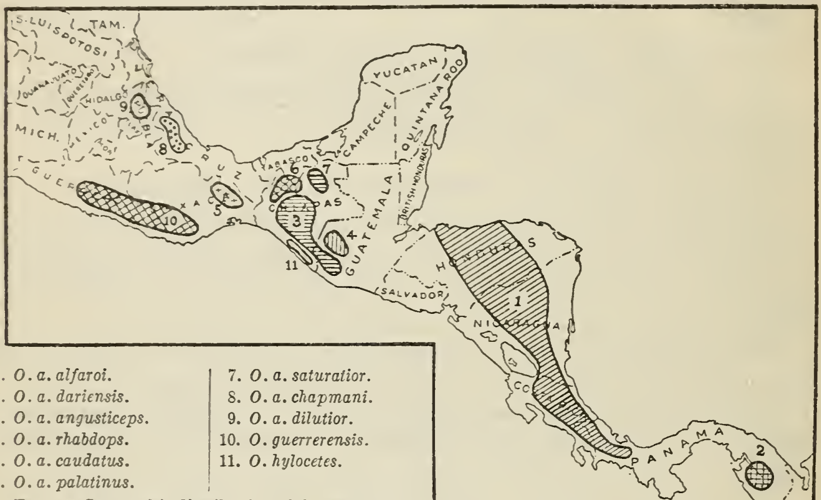
Specimens examined.—Total number, 5, as follows:

Quintana Roo: Puerto Morelos, 1.
Yucatan: Chichen Itza, 4 (type and topotypes).

Oryzomys alfaroi Group.

Geographic distribution.—Mountainous districts from northern Puebla, Mexico, south through Central America and northwestern South America to Ecuador; altitudinal range, from about 1,000 to 10,000 feet, mainly in Humid Upper and Lower Tropical Zones (fig. 5).

General characters.—Size small; form slender; tail usually longer than head and body, thinly and rather indistinctly haired; ears large and conspicuous, thinly clothed externally and internally with short, fine, blackish hairs; general pelage usually rather short and harsh, becoming longest in forms ranging at high elevations; vibrissæ about as long as head; toes of hind feet inconspicuously webbed at base, the longest three bearing tufts of silvery whitish bristles which project beyond the ends of the claws as in the *O. talamancæ* group; claws short and recurved, compressed and sharp pointed. General color dark, the upperparts usually near ochraceous-tawny, heavily mixed with black; underparts dull whitish or pale buffy.



1. *O. a. alfaroi.*
2. *O. a. dariensis.*
3. *O. a. angusticeps.*
4. *O. a. rhabdops.*
5. *O. a. caudatus.*
6. *O. a. palatinus.*
7. *O. a. saturatior.*
8. *O. a. chapmani.*
9. *O. a. dilutior.*
10. *O. guerrerensis.*
11. *O. hylocetes.*

FIG. 5.—Geographic distribution of the *Oryzomys alfaroi* group.

Skull.—Small and delicate in structure, with rostrum elongated, the braincase moderately broad and rather low; maxillary arm of zygoma weakly developed; outer wall of antorbital foramen with anterior border rounded, the antorbital notch only moderately deep as viewed from above; nasals and premaxillæ ending posteriorly in about the same plane; frontal region broad, the lateral margins very slightly elevated to form delicate supraorbital ridges; temporal ridges slightly developed anteriorly along parieto-squamosal sutures, usually becoming obsolescent posteriorly in crossing lateral wings of parietals; interparietal large, somewhat irregularly pointed-elliptical in form; anterior palatine foramina short and broad, shorter than palatal bridge and not usually reaching anterior plane of first molars; palatal pits rather large and rounded; sphenopalatine vacuities present but small; interpterygoid fossa broad; audital bullæ small; angle of mandible short and broad, the inferior border even more strongly turned inward than in the *O. talamancæ* group; coronoid process with free portion short owing to high connecting ridge reaching nearly to summit of condyle; molars small, the reentrant angles shallow and the crown arrangement, especially the enamel islands in the second upper molars, much as in the *O. palustris* group, but inner reentrant angles in first upper molars broader. More reliable distinguishing characters are presented by the skull and teeth; the molars are less deeply cleft by reentrant angles in the *O. alfaroi* group, and the enamel island present at the postero-internal base of the paracone of the second upper molar (moderately worn) is absent in the *talamancæ* group.

Remarks.—This group, comprised of a series of small, dark-colored, closely allied, and somewhat localized forms typified by *O. alfaroi*, extends in an irregular chain along the backbone of the continent from southern Mexico to northwestern South America, one form at least ranging as far south as Ecuador. While the *O. palustris* and *O. talamancæ* groups range mainly at low elevations, or are restricted to the vicinity of water at the higher levels, *alfaroi* and its allies often inhabit well-drained but moist mountain slopes, where they commonly ascend to high elevations.

O. alfaroi and its relatives approach the members of the *O. talamancæ* group in general external characters, and the two partially overlap in geographic range. In appearance individuals may be much alike, both groups having large ears, appearing nearly naked, and slender limbs; forms of the *alfaroi* group are, however, usually smaller and decidedly darker in general color; the ears are smaller, but not markedly different in color.

Key to Species and Subspecies of the O. alfaroi Group.

- *a*¹. Zygomata broader posteriorly than anteriorly.
  - *b*¹. Upperparts darker ochraceous-buff or ochraceous-tawny.
    - *c*¹. Upperparts less intense ochraceous-buff or ochraceous-tawny.
      - *d*¹. Median dorsal area not distinctly blackish.
        - *e*¹. Size smaller; total length less than 240.
          - *f*¹. Skull broader; zygomatic breadth 13 or more.
            - *g*¹. Anterior palatine foramina usually 4 or more.
              - *h*¹. Rostrum more massive. (Northern Puebla.) **O. a. dilutior** (p. 68).
              - *h*². Rostrum less massive. (Central Vera Cruz.) **O. a. chapmani** (p. 67).

g^2. Anterior palatine foramina usually less than 4. (Mountains of Honduras; Nicaragua; Costa Rica; western Panama.) **O. a. alfaroi** (p. 59).
f^2. Skull narrower; zygomatic breadth less than 13. (Mountains of southern Tabasco and northwestern Chiapas.)... **O. a. palatinus** (p. 65).
e^2. Size larger; total length 240 or more.
f^1. Pelage short; tail about 140. (Mountains of northeastern Oaxaca.) **O. a. caudatus** (p. 64).
f^2. Pelage long; tail less than 135. (High mountains of southwestern Guatemala and of central and southern Chiapas.) **O. a. angusticeps** (p. 62).
d^2. Median dorsal area distinctly blackish. (Mountains of northern Chiapas.) **O. a. saturatior** (p. 66).
c^2. Upperparts more intense ochraceous-tawny. (Eastern Panama.) **O. a. dariensis** (p. 61).
b^2. Upperparts paler ochraceous-buff or ochraceous-tawny. (Pacific slope of Sierra Madre in Guerrero and Oaxaca.).................... **O. guerrerensis** (p. 69).
a^2. Zygomata broader anteriorly than posteriorly.
b^1. Size larger; total length 225 or more. (Southeastern Guatemala.) **O. a. rhabdops** (p. 63).
b^2. Size smaller; total length less than 225. (Southern Chiapas.) **O. hylocetes** (p. 70).

ORYZOMYS ALFAROI Allen.

[Synonymy under subspecies.]

Geographic distribution.—Heavily forested mountain slopes from northern Puebla south through southern Mexico and Central America, at least to Colombia and Ecuador; altitudinal range from about 1,000 to 10,000 feet, mainly in Humid Upper and Lower Tropical Zones.

General characters.—Size small; color dark; skull light and rather delicate in structure. Similar in general to *O. guerrerensis*, but color much darker, and skull differing in detail. (For additional general characters see under *O. alfaroi* group.)

Color.—*Fresh pelage:* Upperparts varying from dark ochraceous-buff to ochraceous-tawny, tawny, russet, or cinnamon-brown, usually heavily mixed with black, this color often predominant over dorsum, the lighter element purest and becoming more or less ochraceous-buffy on cheeks, shoulders, and sides; underparts dull white or buffy, thinly overlying the dark plumbeous basal color; nose blackish; inner and outer sides of ears thinly clothed with very short black hairs, light ochraceous-buffy subauricular spots present in some forms, absent in others; feet dull whitish, the elongated silvery tufts on toes of hind feet projecting beyond points of longer claws; feet (epidermis) yellowish, thinly clothed above with very short glossy white hairs; tail nearly naked, brownish or blackish above, yellowish below basally, becoming dark all around toward tip. *Young* (in first pelage): Upperparts blackish, finely and inconspicuously mixed with ochraceous-tawny; underparts darker than in adults, the dark basal color thinly overlaid with white; feet varying from dull whitish to brownish; tail blackish.

Skull.—Similar in general to that of *O. guerrerensis*, but more elongated; braincase higher, less flattened. In the anteriorly spreading zygomata, one form of *O. alfaroi* (*O. a. rhabdops*) approaches *O. hylocetes*, but the latter is much smaller, with very small teeth, and present material seems to indicate specific distinctness. (For additional characters see under *O. alfaroi* group.)

Remarks.—All the North American members of the *O. alfaroi* group, excepting *O. hylocetes* and *O. guerrerensis*, and the South American forms *O. palmiræ* and *O. gracilis*, appear to be assignable subspecifically to *O. alfaroi*.[1] While complete intergradation may not be shown by the material examined, the more essential characters prevail with such uniformity throughout the series as to leave little room for doubt of its existence. The accession of new material may not improbably show that *hylocetes* and *guerrerensis* are also geographic races of *alfaroi*. Typical *alfaroi* presents closer resemblance to the geographically distant race *O. a. chapmani*, of Vera Cruz, than to the annectent forms inhabiting the high mountains of Chiapas and Guatemala. This resemblance between the more widely removed subspecies may be due to the fact that the intermediate races occupy more diversified areas, most of them having ascended to high elevations where peculiar environmental conditions would conduce to differentiation.

ORYZOMYS ALFAROI ALFAROI (Allen).

ALFARO RICE RAT.

(Pl. III, figs. 1, 1a.)

Hesperomys (*Oryzomys*) *alfaroi* Allen, Bull. Amer. Mus. Nat. Hist., III, p. 214, April 17, 1891.

Oryzomys alfaroi Allen, Abstr. Proc. Linn. Soc. New York, 1893–94, p. 36, July 20, 1894.

Oryzomys alfaroi incertus Allen, Bull. Amer. Mus. Nat. Hist., XXIV, p. 655, October 13, 1908. Type from Rio Grande, Nicaragua, No. 28584, ♂ ad., Amer. Mus. Nat. Hist.; collected by W. B. Richardson, March 28, 1908.

Type locality.—San Carlos, Costa Rica.

Type.—No. $\frac{3659}{2808}$, ♀ subadult, American Museum of Natural History; collected by Anastasio Alfaro, December, 1888.

Geographic distribution.—Heavily forested mountainous portions of Honduras, Nicaragua, Costa Rica, and western Panama; altitudinal range from about 1,000 to 4,000 feet; mainly in Humid Lower Tropical Zone.

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[1] The South American forms will therefore stand as follows:

Oryzomys alfaroi palmiræ Allen	Miraflores, Colombia.
Oryzomys alfaroi gracilis Thomas	Concordia, Medellin, Colombia.

General characters.—A rather small form with short pelage, resembling *O. a. dariensis*, but coloration duller, less rufescent; skull differing in slight details. Very similar in general to *O. c. chapmani*, but color usually duller; skull with shorter anterior palatine foramina. Smaller than *O. a. angusticeps* and *O. a. rhabdops*, with shorter pelage than either.

Color.—Upperparts varying from ochraceous-buff to dull ochraceous-tawny, heavily mixed with black. (Other colors as given under *O. alfaroi*.)

Skull.—Size medium for the group, rather narrow and elongated with narrowly spreading zygomata and short, wide anterior palatine foramina. In general form very similar to that of *O. a. dariensis*, but braincase and frontal region usually broader; apparently differing from those of *O. a. angusticeps* and *O. a. chapmani* most noticeably in shorter anterior palatine foramina. Compared with that of *O. a. rhabdops* the skull is decidedly narrower, with smaller, less inflated braincase, and zygomata much less divergent anteriorly.

Measurements.—Average of 6 adults from Tuis, Costa Rica: Total length, 210 (188–221); tail vertebræ, 109 (102–114); hind foot, 26.3 (26–27). *Skull* (average of same): Greatest length, 26.7 (25.6–28.3); zygomatic breadth, 13.5 (13.2–14.1); interorbital breadth, 5.2 (5.1–5.5); width of braincase, 10.5 (10.1–10.8); nasals, 10.9 (10.3–11.5); anterior palatine foramina, 3.9 (3.5–4.9); palatal bridge, 5.4 (5.3–5.7); upper molar series, 3.7 (3.6–3.8).

Remarks.—While a considerable gap separates the known geographic ranges of *O. a. alfaroi* and *O. a. dariensis*, these forms exhibit such close approach in size, color, and cranial details that intergradation may be safely assumed. Specimens from Yaruca, Honduras, are referable to *alfaroi*, but in the larger size shown by some examples are not very unlike *O. a. angusticeps* and *O. a. rhabdops*. Three specimens from Managua, Nicaragua, recorded by Thomas[1] as *O. gracilis*, were probably assignable to *alfaroi*.

Allen's "*O. a. incertus*" was based on rather richly colored specimens which are well within the range of individual variation exhibited by typical *alfaroi*, as the accession of additional material indicated to him.[2]

The general range of *alfaroi* overlaps that of *O. talamancæ*, and as it may closely resemble that species in general appearance some confusion of the two has resulted. While many examples may be inseparable in color, *alfaroi* is a smaller animal than *talamancæ*. The skull of *alfaroi* is distinguished by its smaller size and more delicate structure, the maxillary arm of the zygoma is more slender and the teeth are decidedly smaller; the second upper molar has a large, elongated enamel island at the postero-internal base of the paracone, and the internal reentrant angle extends less than halfway across the crown of the moderately worn tooth, while in *talamancæ* the enamel island mentioned is absent or represented only by a small island near the apex of the reentrant angle, which in this species reaches halfway across the molar crown.

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[1] Thomas, Oldfield, Ann. Mag. Nat. Hist., ser. 6, XVI, p. 57, July, 1895.

[2] Allen, J. A., Bull. Amer. Mus. Nat. Hist., XXVIII, p. 99, Apr. 30, 1910.

Specimens examined.—Total number, 86, as follows:

Costa Rica: San Carlos, 3 (type and topotypes);[1] Tuis, 15;[1] exact locality unknown, 7.[1]
Honduras: Yaruca, 19.[2]
Nicaragua: Chontales, 6;[1] Jalapa, 2;[1] Jicaro, 1;[1] Jinotega, 1;[3] Rio Coco, 5;[1] Rio Grande, 3 (including type of "*incertus*");[1] San Juan, 5;[1] Tuma, 2;[1] Uluce, 2;[1] exact locality unknown, 1.[1]
Panama: Boquete, 14.[4]

ORYZOMYS ALFAROI DARIENSIS Goldman.

Darien Rice Rat.

(Pl. III, figs. 2, 2a; Pl. V, figs. 6; Pl. VI, figs. 3, 3a.)

Oryzomys alfaroi dariensis Goldman, Proc. Biol. Soc. Washington, XXVIII, p. 128, June 29, 1915.

Type locality.—Cana, eastern Panama (altitude 2,000 feet).

Type.—No. 178660, ♀ adult, United States National Museum (Biological Survey collection); collected by E. A. Goldman, March 4, 1912.

Geographic distribution.—Heavily forested mountain slopes in eastern Panama at 2,000 feet altitude, and probably adjacent portions of Colombia; Humid Lower Tropical Zone.

General characters.—A small form closely allied to *O. a. alfaroi;* color of upperparts richer, more rufescent; skull usually narrower. Similar to the South American forms *O. a. gracilis* and to *O. a. palmiræ,* but color more rufescent and skull differing in detail.

Color.—*Fresh pelage:* Upperparts between ochraceous-tawny and tawny, finely mixed with black; becoming paler and ochraceous-buffy on cheeks, shoulders, and lower part of sides; underparts, feet, and tail as given under *O. alfaroi.*

Skull.—About like that of *O. a. alfaroi*, but braincase and frontal region usually narrower. Closely resembling that of *O. a. palmiræ,* of South America, but shorter, with more widely spreading zygomata and smaller teeth. Compared with Ecuadorean specimens assumed to represent *O. a. gracilis*, the skull is more massive, with more widely spreading zygomata.

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[1] Collection Amer. Mus. Nat. Hist.

[2] Fourteen specimens in Mus. Comp. Zool.; 2 in Field Mus. Nat. Hist.

[3] Collection Field Mus. Nat. Hist.

[4] Eleven specimens in Mus. Comp. Zool.; 2 in Field Mus. Nat. Hist.; 1 in Amer. Mus. Nat. Hist.

Measurements.—Type: Total length, 203; tail vertebræ, 107; hind foot, 25.5. Average of 5 adult topotypes: 220 (212–226); 113 (107–117); 24.6 (23–26). *Skull* (average of 6 adults, type and 5 topotypes): Greatest length, 27.3 (26.5–27.8); zygomatic breadth, 14.3 (14–14.7); interorbital breadth, 4.8 (4.6–5); width of braincase, 10.3 (10–10.5); nasals, 11.1 (10.6–11.4); anterior palatine foramina, 4.3 (4–4.8); palatal bridge, 5.6 (5–5.9); upper molar series, 3.7 (3.6–3.9).

Remarks.—This small, slender rice rat differs from typical *O. a. alfaroi*, of Costa Rica, mainly in richer, more tawny coloration. It is closely allied to the Colombian form described as *O. palmiræ* and the latter is clearly assignable to subspecific rank, if it does not prove to be identical with *O. a. gracilis*, the type of which came from farther north in the Cauca Valley. Comparison with specimens from northern Ecuador, assigned to *gracilis* by Mr. Oldfield Thomas, and reference to the original description of that species indicate that the two are very nearly related. The description of the color of *gracilis*, however, seems to apply to the Ecuadorean specimens, or to *palmiræ*, rather than to the Darien animal. Moreover, the skull *O. a. dariensis* is distinguished from that of *gracilis*, as here understood, by the greater lateral expansion of the zygomata.

O. talamancæ also occurs at the type locality of *dariensis* and the two are superficially much alike. The smaller size, especially the smaller hind foot, usually distinguishes *dariensis* externally, while the skull is smaller, more delicate in structure, the maxillary arm of the zygoma more slender and the molar teeth much smaller; the second upper molar has a large elongated enamel island at the postero-internal base of the paracone, and the internal reentrant angle extends less than half way across the crown of the moderately worn tooth, much as in *O. palustris*. In *talamancæ* the enamel island is absent and the reentrant angle reaches halfway across the molar crown.

Specimens examined.—Eleven, from type locality.

ORYZOMYS ALFAROI ANGUSTICEPS Merriam.

Volcan Santa Maria Rice Rat.

Oryzomys angusticeps Merriam, Proc. Washington Acad. Sci., III, p. 292, July 26, 1901.

Type locality.—Volcan Santa Maria, Guatemala (altitude, 9,000 feet).

Type.—No. 76816, ♂ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, January 22, 1896.

Geographic distribution.—Heavily forested slopes of high mountains in southwestern Guatemala and central and southern Chiapas; altitudinal range from about 8,000 to 9,500 feet.

General characters.—Similar to *O. a. alfaroi* but larger, with longer pelage; anterior palatine foramina longer. Closely approaching *O. a. rhabdops* in size, but color darker and skull differing in detail.

Color.—Lighter element in upperparts pale cinnamon brownish, heavily mixed with black, the general tone appreciably darkened by the dark plumbeous basal color of the long pelage; underparts and sides of muzzle light ochraceous-buffy; ears, feet, and tail as given under *O. alfaroi.*

Skull.—Similar to that of *O. a. alfaroi*, but larger, zygomata more squarely spreading anteriorly, the sides more nearly parallel; frontal region usually narrower; anterior palatine foramina longer. Approaching that of *O. a. rhabdops* in size, but zygomata less divergent anteriorly.

Measurements.—Type: Total length, 245; tail vertebræ, 134; hind foot, 29. *Skull* (type): Greatest length, 28.6; zygomatic breadth, 14; interorbital breadth, 4.6; width of braincase, 10.3; nasals, 10.6; anterior palatine foramina, 5; palatal bridge, 5.4; upper molar series, 3.6.

Remarks.—Aside from its geographic neighbor, *O. a. rhabdops*, no other North American form of the *O. alfaroi* group attains so high an altitude; like *rhabdops* it has developed a longer pelage than forms ranging at lower elevations. The skull of the type of *O. a. angusticeps* seems to be abnormally narrow; the topotypes are all young and their skulls of little value for comparative purposes. An apparent tendency toward greater breadth shown in the skulls of specimens from San Cristobal and Pinabete, Chiapas, is believed to be within the probable range of individual variation; on the other hand, they do not differ appreciably from some skulls of *rhabdops*, and suggest intergradation. In size and color the Chiapas examples are very similar to the topotypes.

Specimens examined.—Total number, 16, as follows:

Chiapas: Pinabete, 2; San Cristobal, 10.
Guatemala: Volcan Santa Maria 4 (type and topotypes).

ORYZOMYS ALFAROI RHABDOPS MERRIAM.

CALEL RICE RAT.

(Pl. III, figs. 3, 3a.)

Oryzomys rhabdops Merriam, Proc. Washington Acad. Sci., III, p. 291, July 26, 1901.

Type locality.—Calel, Guatemala (altitude, 10,000 feet).

Type.—No. 76813, ♂ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, January 15, 1896.

Geographic distribution.—Known only from type locality, at about 10,000 feet altitude on the upper slope of the high mountains in southwestern Guatemala.

General characters.—Size large; pelage very long for a member of the *O. alfaroi* group, the longer hairs on dorsum reaching about 11 mm.;

color rather pale, upperparts near ochraceous-tawny; skull broad with anteriorly divergent zygomata. Similar in general to *O. a. angusticeps*, but color paler, and skull differing in detail.

Color.—Fresh pelage: Upperparts near ochraceous-tawny, richest and purest on cheeks, shoulders, and sides, the back darkened by black hairs, but less copiously than in most forms of *O. alfaroi;* sides of muzzle and underparts in general light ochraceous-buffy; nose deep black, except extreme tip which, like lips, is whitish; ears black, with more or less distinct light ochraceous-buffy subauricular spots; feet and tail as given under *O. alfaroi. Young* (in first pelage): Upperparts blackish, inconspicuously tinged with ochraceous-tawny; underparts plumbeous, lightly overlaid with light ochraceous-buff.

Skull.—Skull broad, with large inflated braincase and anteriorly diverging zygomata. Similar to that of *O. a. angusticeps*, but zygomata wider anteriorly than posteriorly (sides more nearly parallel in *angusticeps*). In general form, especially the anteriorly spreading zygomata, similar to that of *O. hylocetes*, but much larger, with shorter anterior palatine foramina.

Measurements.—Type: Total length, 255; tail vertebræ, 141; hind foot, 29.5. Adult topotype: 255; 138; 28.5. *Skull* (average of two adults—type and topotype): Greatest length, 28.6 (28.4–28.8); zygomatic breadth, 14.8 (14.6–15.1); interorbital breadth, 4.8 (4.8–4.9); width of braincase, 10.9 (10.8–11.1); nasals, 11 (10.5–11.5); anterior palatine foramina, 4.3 (4.2–4.5); palatal bridge, 5.7 (5.5–5.9); upper molar series, 3.8 (3.7–3.9).

Remarks.—No other North American form of the genus is known to range 10,000 feet above sea level, but a near geographic neighbor, *O. a. angusticeps*, which has also pushed up above the Tropical Zones on mountains of similar elevation, approaches and may equal this altitude. The two forms are evidently closely allied. Distinguishing cranial characters are developed mainly in adults, the skulls of most of the younger examples being apparently inseparable. In the remarkable anterior expansion of the zygomata the skull of *O. a. rhabdops* resembles that of *O. hylocetes*, but the latter appears to be a very distinct form.

Specimens examined.—Fourteen, from type locality.

ORYZOMYS ALFAROI CAUDATUS Merriam.

COMALTEPEC RICE RAT.

(Pl. III, figs. 4, 4a.)

Oryzomys chapmani caudatus Merriam, Proc. Washington Acad. Sci , III, p. 289, July 26, 1901.

Type locality.—Comaltepec, Oaxaca, Mexico (altitude 3,500 feet).

Type.—No. 68641, ♂ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, July 31, 1894.

Geographic distribution.—Mountains of northeastern Oaxaca; altitudinal range from 3,500 to 6,500 feet; Humid Upper Tropical Zone.

General characters.—Size largest of the *O. alfaroi* group; color dark; pelage short. Similar in general to *O. a. chapmani*, but decidedly larger, with the lighter colored admixture in upperparts of ochraceous-buffy instead of ochraceous-tawny; skull larger and more massive than usual in the *alfaroi* group.

Color.—*Fresh pelage:* Upperparts ochraceous-buffy, heavily mixed with black, the latter color predominating, especially along lower part of back; underparts and sides of muzzle light ochraceous-buffy; lips and chin whitish; nose black; ears, feet, and tail as given under *O. alfaroi.*

Skull.—Size very large and structure heavy for *O. alfaroi.* Very similar in general form to that of *O. a. chapmani*, but much larger with more swollen rostrum.

Measurements.—Type: Total length, 257; tail vertebræ, 141; hind foot, 30. *Skull* (type): Greatest length, 29; zygomatic breadth, 15; interorbital breadth, 5; width of braincase, 11.3; nasals, 11.4; anterior palatine foramina, 4.8; palatal bridge, 5.2; upper molar series, 3.9.

Remarks.—*O. a. caudatus* was based on a single specimen which seems to indicate a subspecies still larger than *O. a. rhabdops* and *O. a. angusticeps*, but the extent of individual variation remains to be determined. Although not very widely differing from *angusticeps* it seems to be most closely allied to *O. a. chapmani*, the greater size being the chief distinguishing character. An immature example from 6,500 feet altitude at Totontepec, Oaxaca, is referable to the same form.

Specimens examined.—Total number, 2, as follows:

Oaxaca: Comaltepec, 1 (type); Totontepec, 1.

ORYZOMYS ALFAROI PALATINUS Merriam.

Teapa Rice Rat.

(Pl. III, figs. 5, 5a.)

Oryzomys palatinus Merriam, Proc. Washington Acad. Sci., III, p. 290, July 26, 1901.

Type locality.—Teapa, Tabasco, Mexico (altitude, 3,000 feet).

Type.—No. 99977, ♀ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, April 1, 1900.

Geographic distribution.—Forested mountain slopes in southern Tabasco and northwestern Chiapas; known altitudinal range from about 3,000 to 3,500 feet; Humid Upper Tropical Zone.

General characters.—A small form, similar to *O. a. chapmani* in color, but skull narrower, lighter, and more like that of the darker subspecies *O. a. saturatior.*

Color.—Type in fresh pelage: Upperparts rich ochraceous-tawny, finely and uniformly lined with black from nose over top of head and back to near base of tail, the tawny element becoming purer and paler on cheeks and along lower part of sides; underparts and feet dull whitish; tail dark brownish, except basal half of under side, which is dull yellowish. Specimens from Ocuilapa, Chiapas, apparently referable to this form, are indistinguishable in color from *O. a. chapmani.*

Skull.—Size small, general form long and narrow, structure light. Scarcely distinguishable from some of the narrower skulls of *O. a. saturatior;* zygomata very slender as in that form. Similar in general to that of *O. a. chapmani,* but narrower, maxillary arm of zygoma more slender.

Measurements.—Type: Total length, 209; tail vertebræ, 106; hind foot, 25. Adult from Tumbala, Chiapas: 222; 116; 27. *Skull* (type): Greatest length, 26.7; zygomatic breadth, 12.6; interorbital breadth, 4.8; width of braincase, 10.2; nasals, 10.2; anterior palatine foramina, 3.8; palatal bridge, 5.5; upper molar series, 3.8.

Remarks.—In *O. a. palatinus* the general color of *O. a. chapmani* seems to be combined with the narrower, lighter skull of the darker-colored form *O. a. saturatior.* The scanty material available indicates that intergradation of *palatinus* with *saturatior* is probable, since the differential characters are slight and both forms inhabit the northern slope of the same mountain range.

Specimens examined.—Total number, 5, as follows:

Chiapas: Ocuilapa, 3; Tumbala, 1.
Tabasco: Teapa, 1 (type).

ORYZOMYS ALFAROI SATURATIOR Merriam.

Dusky Rice Rat.

Oryzomys chapmani saturatior Merriam, Proc. Washington Acad. Sci., III, p. 290, July 26, 1901.

Type locality.—Tumbala, Chiapas, Mexico (altitude, 5,000 feet).

Type.—No. 76183, ♀ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, October 23, 1895.

Geographic distribution.—Forested northern slope of mountains of northern Chiapas, at 5,000 feet altitude, limits of range unknown; Humid Upper Tropical Zone.

General characters.—Size rather small—about as in *O. a. alfaroi* and *O. a. chapmani;* color very dark. Closely allied to *O. a. palatinus* and *chapmani,* but darker than either, the back blackish and underparts usually distinctly buffy.

Color.—Upperparts cinnamon brownish, very heavily mixed with black, the top of head and median dorsal area blackish; underparts, except chin and throat, varying from light to dark ochraceous-buff; chin and throat more or less distinctly whitish, the fur in some examples pure white to roots along a narrow median line; ears black; feet brownish to toes, the toes dull yellowish, those of hind feet bearing the silvery terminal bristles present throughout the group; tail usually dark all around, but in some examples yellowish on under side at base. *Young* (in first pelage): Upperparts nearly black, the cinnamon brownish hairs inconspicuous and restricted mainly to the sides; underparts dark plumbeous, very thinly overlaid with ochraceous-buff; feet and tail blackish.

Skull.—Size small and structure light. About like that of *O. a. palatinus*, but usually broader. Similar to that of *O. a. chapmani*, but averaging slightly smaller, with less swollen rostrum and more slender zygomata.

Measurements.—Type: Total length, 218; tail vertebræ, 120; hind foot, 25.5. Average of 10 adults (type and 9 topotypes): 208.4 (195–225); 111.1 (105–122); 26.1 (25–28). *Skull* (average of 3 adults—type and 2 topotypes): Greatest length, 25.3 (25.2–25.4); zygomatic breadth, 12.8 (12.4–13.5); interorbital breadth, 4.7 (4.5–4.8); width of braincase, 10.1 (10–10.3); nasals, 9.8 (9.5–10.2); anterior palatine foramina, 4.2 (3.7–4.5); palatal bridge, 5.1 (4.9–5.3); upper molar series, 3.6 (3.5–3.6).

Remarks.—The very dark colors of *O. a. saturatior* appear to be directly due to environmental conditions. The area inhabited by this form is heavily forested and excessively humid; torrential rains occur during the wet season and fog enshrouds the mountains nearly throughout the year. Two specimens from Tumbala, with narrow skulls and slender rostra, approach *O. a. palatinus*, whose range is doubtless contiguous, and point to intergradation with that form.

Specimens examined.—Seventeen, from type locality.

ORYZOMYS ALFAROI CHAPMANI Thomas.

Chapman Rice Rat.

Oryzomys chapmani Thomas, Ann. Mag. Nat. Hist., ser. 7, I, p. 179, February, 1898.

Type locality.—Jalapa, Vera Cruz, Mexico (altitude, 4,400 feet).

Type.—97.9.9.30, British Museum; collected by Frank M. Chapman, March 31, 1897.

Geographic distribution.—Forested eastern slopes of the Mexico plateau region in central Vera Cruz; known altitudinal range from 4,400 to 6,000 feet; Humid Upper Tropical Zone.

General characters.—Closely resembling *O. a. alfaroi;* size and color very similar, but general tone of upperparts averaging slightly richer, more tawny; cranial characters distinctive. Size about as in *O. a. dilutior*, but color slightly more tawny; skull much less massive;

differing from *O. a. caudatus* in much smaller size and more tawny color.

Color.—Fresh pelage: Upperparts near ochraceous-tawny (becoming russet in some old adults), finely and abundantly mixed with black, the tawny element purer but somewhat paler and grading toward dark ochraceous-buff along cheeks and lower part of sides; underparts whitish or pale buffy, the plumbeous basal color showing through except over a narrow median area on throat and chest, where the fur in some specimens is pure white to roots; ears black, light subauricular spots usually present; feet and tail as given under *O. alfaroi*. *Young* (in first pelage): Upperparts blackish, inconspicuously mixed with ochraceous-tawny; underparts darker than in adults, the dark basal color less heavily overlaid with white; feet and tail brownish (becoming paler in adults).

Skull.—Size and general form much as in *O. a. alfaroi*, but tending to be shorter and relatively broader, the zygomata more widely or squarely spreading anteriorly; frontal region usually narrower; anterior palatine foramina longer, commonly reaching anterior plane of first molars; dentition about the same. Similar to that of *O. a. dilutior*, but less massive; rostrum less swollen and decurved; maxillary arm of zygoma more slender. Much like that of *O. a. caudatus*, but much smaller.

Measurements.—Average of 10 adult topotypes: Total length, 224 (202–265); tail vertebræ, 117.9 (108–132); hind foot, 25.1 (24–27). *Skull* (average of 7 adult topotypes): Greatest length, 26.4 (25.4–27.3); zygomatic breadth, 13.7 (13.1–14.4); interorbital breadth, 4.7 (4.4–4.8); width of braincase, 10.7 (10.2–11); nasals, 10.3 (9.6–10.9); anterior palatine foramina, 4.4 (4–4.7); palatal bridge, 5.3 (5–5.6); upper molar series, 3.8 (3.7–3.9).

Remarks.—The general resemblance of *O. a. chapmani* to *O. a. alfaroi* is noteworthy, in view of their geographic separation and the occurrence of apparently annectent forms that differ considerably from both. The annectent forms, however, inhabit diversified areas, some having ascended to high elevations, where their differentiation has probably been the result of rather local environmental conditions.

Specimens examined.—Total number, 25, as follows:

Vera Cruz: Jalapa, 17 (type and topotypes);[1] Jico, 6; Mirador, 1; Teocelo, 1.[2]

ORYZOMYS ALFAROI DILUTIOR MERRIAM.

PUEBLA RICE RAT.

(Pl. III, figs. 6, 6a.)

Oryzomys chapmani dilutior Merriam, Proc. Washington Acad. Sci., III, p. 290, July 26, 1901.

Type locality.—Huauchinango, Puebla, Mexico (altitude 5,000 feet).

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[1] Thirteen in collection Amer. Mus. Nat. Hist.

[2] Collection Mus. Comp. Zool.

Type.—No. 93124, ♂ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, January 10, 1898.

Geographic distribution.—Eastern slope of Mexican plateau region at 5,000 feet altitude in northern Puebla; limits of range unknown; Humid Upper Tropical Zone.

General characters.—Similar in size to *O. a. chapmani*, but color slightly paler, less tawny; skull more massive.

Color.—About as in *O. a. chapmani*, but slightly paler, the general tone less tawny.

Skull.—Most like that of *O. a. chapmani*, but more massive; rostrum more swollen, the upper outline more strongly decurved; maxillary arm of zygoma heavier.

Measurements.—Type: Total length, 223; tail vertebræ, 117; hind foot, 28. An adult topotype: 225; 125; 27.5. *Skull* (type and adult topotype): Greatest length, 27.6, 27.4; zygomatic breadth, 15, 14.2; interorbital breadth, 4.9, 4.6; width of braincase, 10.8, 10.4; nasals, 10.3, 10.5; anterior palatine foramina, 4.6, 4.4; palatal bridge, 5.2, 5; upper molar series, 4, 4.

Remarks.—The range of *O. a. dilutior* marks the northern limit of the *O. alfaroi* group. The subspecies appears to be a well-marked form, requiring close comparison only with *O. a. chapmani*.

Specimens examined.—Three, from type locality.

ORYZOMYS GUERRERENSIS Goldman.

Guerrero Rice Rat.

(Pl. III, figs. 7, 7a.)

Oryzomys guerrerensis Goldman, Proc. Biol. Soc. Washington, XXXVIII, p. 127, June 29, 1915.

Type locality.—Omilteme, Guerrero, Mexico (altitude 8,000 feet).

Type.—No. 127517, ♂ adult (molars moderately worn), United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, May 20, 1903.

Geographic distribution.—Forested Pacific slope of Sierra Madre in Guerrero and Oaxaca, Mexico; altitudinal range from 3,000 to about 8,000 feet; Humid Upper Tropical Zone.

General characters.—Size small; color averaging palest of the North American forms of the *O. alfaroi* group. Similar in general to *O. a. chapmani*, but color paler and skull smaller and flatter.

Color.—Upperparts varying from dark ochraceous-buff to dark ochraceous-tawny, purest on cheeks, shoulders, and sides; the face, top of head, and back darkened by a moderate admixture of black hairs; underparts dull grayish white, the dark basal color of the fur everywhere showing through, except in 2 examples out of 8, in which the fur is pure white to roots along a narrow median line on chin and throat; outer and inner sides of ears well clothed with deep glossy black hairs; feet whitish; tail brownish above, irregularly yellowish below to near tip, which is dusky all around. *Young* (in first pelage): As in *O. a. chapmani*.

Skull.—Small and short, the braincase broad and somewhat flattened. Similar to that of *O. a. chapmani*, but usually smaller and flatter; zygomata tending to curve evenly outward, the sides less nearly parallel; sides of rostrum more tapering anteriorly; ascending branches of premaxillæ usually broader posteriorly; maxillary arm of zygoma more slender; incisors smaller.

Measurements.—Type: Total length, 220; tail vertebræ, 118; hind foot, 27. Adult from Pluma, Oaxaca: 221; 116; 26.5. *Skull* (type): Greatest length, 26.3; zygomatic breadth, 14; interorbital breadth, 4.9; width of braincase, 10.6; nasals, 10.1; anterior palatine foramina, 4; palatal bridge, 5.5; upper molar series, 3.8.

Remarks.—The range of *O. guerrerensis* marks the northern limit of the distribution of the *O. alfaroi* group along the western slope of the mountains bordering the Pacific coast of Mexico. As in other southern groups, the general range of *O. alfaroi* and its allies seems to bifurcate north of the Isthmus of Tehuantepec, the forms which pass farther to the northward along the eastern and western slopes of the interior plateau region being isolated and developing differential characters. The ranges of *O. guerrerensis* and *O. a. chapmani* appear to be completely separated, and while these forms differ appreciably in numerous details, they agree rather closely in the more essential features, and may prove to intergrade through the much larger form *O. a. caudatus*. The latter, however, as at present understood, exhibits so wide a departure from *guerrerensis* that close comparison seems unnecessary.

Specimens examined.—Total number, 8, as follows:

Guerrero: Omilteme, 6 (type and topotypes).
Oaxaca: Pluma, 2.

ORYZOMYS HYLOCETES MERRIAM.

CHIAPAS RICE RAT.

(Pl. III, figs. 8, 8a.)

Oryzomys hylocetes Merriam, Proc. Washington Acad. Sci., III, p. 291, July 26, 1901.

Type locality.—Chicharras, Chiapas, Mexico (altitude 3,500 feet).

Type.—No. 77605, ♂ old, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, February 14, 1896.

Geographic distribution.—Heavily forested Pacific slope, at 3,500 feet, of mountains along continental divide in extreme southern

Chiapas, and doubtless adjacent portions of Guatemala; Humid Upper Tropical Zone.

General characters.—Size small; color dark; pelage short; skull short and relatively broad across anterior roots of zygomata. Somewhat similar to *O. a. angusticeps* and *O. a. rhabdops*, but much smaller than either, and cranial characters distinctive.

Color.—About as in *O. a. saturatior.*

Skull.—General form short, with posteriorly narrow braincase and anteriorly divergent zygomata; anterior palatine foramina rather long, but not reaching anterior plane of first molars; molars small. In size the skull is perhaps nearest to that of *O. a. saturatior*, but it differs in the anterior expansion of the zygomata and departs from that of its larger and nearer geographic neighbor *O. a. angusticeps* in the same respect. The skull is similar in general outline, especially the form of zygomata, to that of *O. a. rhabdops*, but very much smaller.

Measurements.—Type: Total length, 217; tail vertebræ, 118; hind foot, 27. *Skull* (type): Greatest length, 26.2; zygomatic breadth, 13.6; interorbital breadth, 4.6; width of braincase, 9.9; nasals, 9.7; anterior palatine foramina, 4.5; palatal bridge, 5.3; upper molar series, 3.5.

Remarks.—Two examples only of *O. hylocetes* are known, one old and in worn pelage, the other very young, and the range of individual variation the form may present can not now be determined. The species inhabits the lower slope of the mountains, while the upper levels of the same range are occupied by *O. a. angusticeps*, a much larger form, with longer pelage and apparently representing a distinct specific type; but only through the accession of new material can the exact relationship of the two be made clear. The skull in general contour bears a striking resemblance to that of the otherwise different Guatemalan form, *O. a. rhabdops.*

Specimens examined.—Two, from type locality.

Oryzomys talamancæ Group.

Geographic distribution.—Forested districts in eastern Costa Rica and Panama, and south in South America at least to southern Brazil; altitudinal range from sea level to 3,000 feet in Panama; Arid and Humid Lower Tropical Zones (fig. 6).

General characters.—Size large; form rather slender; tail about equal to or somewhat exceeding head and body, scantily and indistinctly haired; ears large and conspicuous, thinly clothed externally and internally, with very short, fine, almost microscopic hairs, general pelage short, rather harsh, and lacking the woolly quality of *O. palustris;* vibrissæ about as long as head; toes of hind feet more or less distinctly webbed at base, the longest three bearing conspicuous tufts of silvery bristles which extend beyond the points of the claws; claws short, recurved, compressed, and sharp pointed. Color of upperparts varying from rich ochraceous-tawny to cinnamon brown or russet, lined with black; underparts white or buffy whitish.

Skull.—Size large, with rostrum long and braincase low and somewhat flattened; maxillary arm of zygoma heavy; outer wall of antorbital foramen with projecting border rounded or sloping forward, the antorbital notch rather shallow as viewed from above; nasals and premaxillæ about conterminous posteriorly; frontal region wide, the lateral margins trenchant, a more or less conspicuous depression on median line close to posterior ends of nasals; temporal ridges moderately developed anteriorly along parieto-squamosal sutures, becoming indistinct posteriorly in crossing lateral wings of parietals; interparietal large; anterior palatine foramina short and broad, much shorter than palatal bridge, not reaching anterior plane of first molars; palatal pits small; spheno-palatine vacuities small; interpterygoid fossa broad; audital bullæ small, the inner sides largely overlapped by mastoids; basi-occipital broad; angle of mandible moderately broad, the inferior border strongly turned inward; coronoid process rather short and low; molars moderately heavy; the inner reentrant angles in upper molars and outer reentrant angles in lower molars, deeply cutting the crowns; mandibular tooth row decidedly narrower posteriorly than anteriorly; tubercle over root of lower incisor weakly developed. Contrasted with those of the *O. palustris* group, skulls of *O. talamancæ* and its allies differ especially in greater length of rostrum, shorter anterior palatine foramina in relation to length of palatal bridge, smaller size of audital bullæ, and in dental detail; the upper molars are more deeply cleft by inner reentrant angles and the lower molars by outer reentrant angles; the second upper molar differs especially in the more nearly equal size of the protocone and hypocone (protocone larger than hypocone in *palustris*), owing to more central position of inner reentrant angle, and in the absence of the large, elongated enamel island extending, in the moderately worn tooth of *palustris*, along the postero-internal base of the paracone, or the reduction of this island to a smaller one, appearing in *talamancæ* near the mesostyle; the third lower molar is more triangular in outline than in *palustris*, the posterior division being decidedly narrower than the anterior.

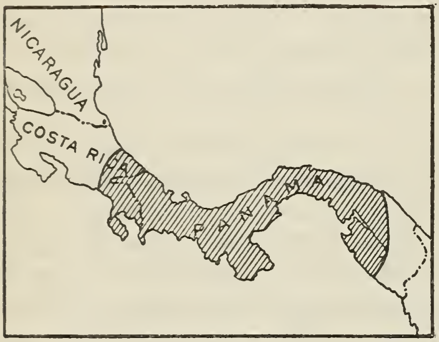

FIG. 6.—Geographic distribution of *Oryzomys talamancæ*.

Remarks.—The group name used is that of the single North American species, *O. talamancæ* of Costa Rica. This species typifies a series of wide distribution in South America; *O. mollipilosus* and *O. medius* are closely allied Colombian and Venezuelan forms, and others of this unrevised group range far south in Brazil.

The *O. talamancæ* group is more nearly related to the *O. bombycinus* group than to any other North American section of the genus, and representatives of the two sometimes share the same local habitat. Members of the *talamancæ* group are externally separable by the shortness of their pelage, while the heavier rostrum and the extension of the lateral wings of the parietals below the temporal ridges are distinguishing cranial characters. In dentition the two groups agree very closely.

ORYZOMYS TALAMANCÆ Allen.

Talamanca Rice Rat.

(Pl. IV, figs. 3, 3a; Pl. V, fig. 7; Pl. VI, figs. 4, 4a.)

Oryzomys talamancæ Allen, Proc. U. S. Nat. Mus., XIV, p. 193, July 24, 1891.

Oryzomys panamensis Thomas, Ann. Mag. Nat. Hist., ser. 7, VIII, p. 252, September, 1901. Type from City of Panama, Panama. No. 0.5.1.67, ♀, British Mus.; collected by E. André, February 25, 1899.

Oryzomys carrikeri Allen, Bull. Amer. Mus. Nat. Hist., XXIV, p. 656, October 13, 1908. Type from Rio Sicsola, Talamanca, Costa Rica. No. 25976, ♀ ad., Amer. Mus. Nat. Hist.; collected by M. A. Carriker, jr., August 18, 1904.

Type locality.—Talamanca, Costa Rica (probably near Sipurio, in the valley of the Rio Sicsola).

Type.—No. $\frac{12222}{22742}$, ♂ adult (molars much worn), United States National Museum; collected by W. M. Gabb.

Geographic distribution.—Heavily forested regions from eastern Costa Rica eastward through Panama to near Colombian frontier; altitudinal range from sea level to 3,000 feet; Arid and Humid Lower Tropical Zones.

General characters.—Externally similar to *O. mollipilosus* of South America; skull narrower. (For additional general characters see under *O. talamancæ* group.)

Color.—General color of upperparts varying from pale ochraceous-tawny to cinnamon brown or russet, becoming lighter and in some specimens ochraceous-buffy on cheeks, shoulders, and sides; underparts dull white or buffy whitish, the plumbeous basal color showing through; ears brownish, indistinctly clothed externally with very short dusky hairs and internally with almost microscopic buffy or grayish hairs; feet (epidermis) dull yellowish, thinly covered above with short glossy white hairs, the hind feet with tufts of silvery bristles projecting beyond claws of longer digits; tail (epidermis) dark brownish above, varying from light brownish to dull yellowish.

Skull.—About like that of *O. mollipilosus,* but braincase and frontal region decidedly broader.

Measurements.—Type (dry skin): Total length, 233; tail vertebræ, 115; hind foot, 30. Average of three adults from Rio Sicsola, Costa Rica: 251 (240–265); 124 (118–133); 29.8 (29–30. 5). *Skull* (type): Greatest length, 31.5; zygomatic breadth, 15.5; interorbital breadth, 5.3; width of braincase, 11.2; nasals, 12.8; anterior palatine foramina, 4.3; palatal bridge, 7.1; upper molar series, 4.6.

Remarks.—Specimens from the Canal Zone and as far east as extreme eastern Panama seem referable to typical *O. talamancæ* of Costa Rica. Two examples from Gatun, Canal Zone, have been submitted to Mr. Oldfield Thomas for comparison with the type of "*O. panamensis*" in the British Museum. The result of his examination he has kindly written as follows: "We have only one specimen of *O. panamensis* [the type] and it is both larger and more rufous than your specimens. But it is older; the skull agrees in general characters and the toothrow is of exactly the same length. As to the colour I think the difference is only due to the coming on of the faded fulvous stage found in the old specimens of most species of *Oryzomys.* Personally I should certainly refer your specimens to *panamensis.*" Since the examples used for comparison are regarded as fairly typical of *talamancæ* I conclude that *panamensis* must be placed in the synonymy of that species.

The type and two topotypes of "*O. carrikeri*" Allen agree essentially with the type of *talamancæ.* The exact locality of the latter is not definitely known, but Gabb, the collector, worked mainly near Sipurio and probably secured the specimen there. The Carriker collection came from about halfway between Cuabre and the mouth of the Rio Sicsola, the two localities being, on this assumption, not far apart in the same river valley.

The ranges of *talamancæ* and *O. alfaroi* overlap, and owing to their superficial resemblance the two have sometimes been confused; *talamancæ* is a larger animal than *alfaroi,* with a longer hind foot. The skulls, however, present the safest distinguishing characters, that of *talamancæ* being more massive, with heavier maxillary arms of zygomata, and heavier dentition; the first and second upper molars, besides differing in details of crown arrangement, are more deeply cleft by inner reentrant angles and all the lower molars by outer reentrant angles, while in *alfaroi* they more nearly approach the condition shown in *O. palustris.*

Specimens examined.—Total number, 20, as follows:

Costa Rica: Boruca, 1;[1] Rio Sicsola, 3 (including type of "*carrikeri*");[2] Talamanca, 1 (type).

Panama: Cana, 7; Cerro Brujo, 1; Divala, 1;[1] Gatun, 6.

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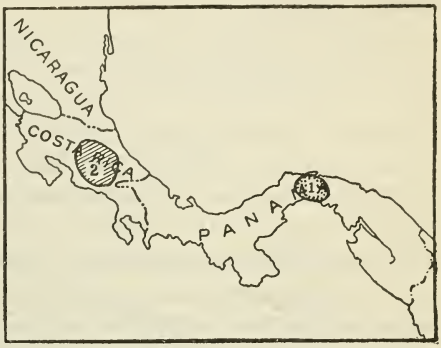
[1] Collection Mus. Comp. Zool.

[2] Collection Amer. Mus. Nat. Hist.

Oryzomys bombycinus Group.

Geographic distribution.—Forested regions from southern Costa Rica south through Panama at least to northern Ecuador; altitudinal range from near sea level to at least 3,000 feet; Humid Lower Tropical Zone (fig. 7).

General characters.—Size large; form rather slender; tail about equal to or slightly longer than head and body, scantily and very indistinctly haired; pelage of upperparts very long (that of back measuring about 12 mm.), underfur not woolly as in *O. palustris;* supraorbital vibrissæ 50 to 70 mm. in length (exceeding those arising from the muzzle), reaching posteriorly to sides of body; ears rather large and naked appearing, the short, fine hairs scattered over inner and outer surfaces almost microscopic; hind feet slender, very scantily haired above, the plantar surface generally smooth, but in some examples indistinctly granular between interdigital tubercles; toes of hind feet more or less distinctly webbed at base, the longest three bearing conspicuous tufts of silvery bristles projecting beyond ends of claws as in the *O. talamancæ* group; claws short, recurved, compressed, and sharp pointed. Colors dark; upperparts near cinnamon brown or russet; underparts overlaid with dull white.



1. *O. b. bombycinus.* | 2. *O. b. alleni.*

FIG. 7.—Geographic distribution of subspecies of *Oryzomys bombycinus.*

Skull.—Size rather large, with rostrum long and narrow, the nasals attenuate and slightly exceeding premaxillæ in posterior extent; braincase broad and moderately expanded; zygomata slender; outer wall of antorbital foramen with projecting upper anterior border well rounded, the antorbital notch broad but not deeply cutting zygoma as viewed from above; frontal region moderately broad and somewhat flattened, the small depression on median line near anterior border deep and conspicuous, and more or less involving ends of nasals; lateral margins of frontals rising in distinct, but narrow, compressed ridges; temporal ridges well developed, bounding parietals laterally as far as lateral extension of supraoccipital, where they turn abruptly and are continued downward along the anterior border of that segment; parietals without lateral wings extending across temporal ridges; interparietal large, reaching transversely nearly across posterior parietal border; anterior palatine foramina short, not reaching anterior plane of first molars; palatal pits small; spheno-palatine vacuities very small or absent; interpterygoid fossa broad; audital bullæ small; basi-occipital broad; angle of mandible broad, the inferior border strongly turned inward; coronoid process rather large and broad across base; molars moderately heavy, the crown arrangement of the *O. talamancæ* type, the crowns deeply incised by reentrant angles and the mandibular toothrow much narrower posteriorly; second upper molar about as in *talamancæ*, the elongated enamel island present in *O. palustris*, *O. melanotis* and *O. alfaroi* groups, being absent or displaced by a bending backward of the commissure of the paracone and protocone; third lower molar long and narrow, the large outer reentrant angle extending more than halfway across the crown.

Remarks.—Forms of this group differing only subspecifically among themselves evidently range from Costa Rica to Ecuador and may extend much farther; the group, therefore, seems to be mainly South American in distribution. Owing to lack of definite knowledge of the relationships of the South American forms it seems best to treat the North American representatives as specifically distinct until a revision of the South American species can be undertaken.

In many important characters, especially of the skull and dentition, the *O. bombycinus* group approaches the *O. talamancæ* group and the two sometimes occur together in the same localities. The *bombycinus* group is easily recognizable externally by the much greater length of the pelage, while the skull is sufficiently distinguished by the slender rostrum and the absence of the lateral wings of the parietals, which in the *talamancæ* group extend across the temporal ridges at the expense of the squamosals. Unlike many groups of the genus which show a preference for open or partially open situations *O. bombycinus* seems to be at home in the depth of the forest.

ORYZOMYS BOMBYCINUS Goldman.

[Synonymy under subspecies.]

Geographic distribution.—Heavily forested areas from southern Costa Rica to eastern Panama, and probably western Colombia; altitudinal range from sea level to at least 3,000 feet; Humid Lower Tropical Zone.

General characters.—(See under *O. bombycinus* group).

Color.—General color of upperparts varying from ochraceous-tawny to cinnamon brown or russet finely mixed with black; darkest on face, top of head, and back, the lighter element restricted to tips of hairs and the dark basal color showing through, becoming lighter and approaching ochraceous-buff or pale ochraceous-tawny on cheeks, shoulders, and sides; underparts dull whitish; ears black, the outer and inner sides thinly clothed with very short dusky hairs; feet (epidermis) dull yellowish, the hairs whitish; tail dark brownish above, light brownish below. *Young* (about two-thirds grown): Upperparts blackish, nearly pure black on face, top of head, and back, becoming lighter and more distinctly lined with ochraceous-buffy hairs on cheeks, shoulders, and sides.

Skull.—(See under *O. bombycinus* group.)

Remarks.—Two closely allied forms inhabit Panama and Costa Rica, and may not improbably prove to be geographic races of *O. nitidus* of Peru, since Ecuadorean specimens believed to be near *nitidus* show close alliance to the North American forms.

Key to Subspecies of O. bombycinus.

*a*¹. Braincase less inflated. (Panama.)..................**O. b. bombycinus** (p. 77).
*a*². Braincase more inflated. (Costa Rica.)...................**O. b. alleni** (p. 78).

ORYZOMYS BOMBYCINUS BOMBYCINUS GOLDMAN.

LONG-HAIRED RICE RAT.

(Pl. II, figs. 7, 7a; Pl. V, fig. 8; Pl. VI, figs. 5, 5a.)

Oryzomys bombycinus Goldman, Smiths. Misc. Coll., LVI, No. 36, p. 6, February 19, 1912.

Type locality.—Cerro Azul, near headwaters of Chagres River, Panama (altitude, 2,500 feet).

Type.—No. 171105, ♂ adult, United States National Museum (Biological Survey collection); collected by E. A. Goldman, March 26, 1911.

Geographic distribution.—Mountains of east-central Panama; altitudinal range from 1,000 to 3,000 feet; Humid Lower Tropical Zone.

General characters.—Size about as in *O. b. alleni*, color identical; skull with much flatter, less expanded braincase.

Color.—(See under *O. bombycinus.*)

Skull.—Similar to that of *O. b. alleni*, but braincase lower, flatter, much less distended, especially anteriorly; frontal region narrower posteriorly.

Measurements.—Type: Total length, 252; tail vertebræ, 127; hind foot, 32. *Skull* (type and adult topotype): Greatest length, 31.3, 31.7; zygomatic breadth, 15.4, 16.1; interorbital breadth, 5.5, 5.4; width of braincase, 11.2, 11.6; nasals, 12.2, 12.2; anterior palatine foramina, 5, 4.5; palatal bridge, 6.2, 6.1; upper molar series, 4.7, 4.4.

Remarks.—The Panama form apparently differs from the Costa Rican animal only in cranial characters, and the specimens on which it is based closely resemble Ecuadorean examples believed to be near *O. nitidus*. The four Panama specimens are very slightly paler in color than five from Ecuador, with skulls also similar, but the zygomata more strongly bowed outward, the sides less nearly parallel.

Specimens examined.—Total number, 4, as follows:

Panama: Cerro Azul, 3 (type and topotypes); Cerro Brujo, 1.

ORYZOMYS BOMBYCINUS ALLENI Goldman.

Allen Rice Rat.

(Pl. II, figs. 8, 8a.)

Oryzomys nitidus alleni Goldman, Proc. Biol. Soc. Washington, XXVIII, p. 128, June 29, 1915.

Type locality.—Tuis (about 35 miles east of Cartago), Costa Rica.

Type.—No. $\frac{9631}{7971}$, ♂ subadult (teeth slightly worn), American Museum of Natural History; collected by George K. Cherrie, July 15, 1894.

Geographic distribution.—Mountainous portions of southern Costa Rica; altitudinal range from 800 to about 2,000 feet; Humid Lower Tropical Zone.

General characters.—Size about as in *O. b. bombycinus;* color identical; skull with braincase higher, much more fully expanded.

Color.—As in *O. b. bombycinus.* (See under *O. bombycinus* group.)

Skull.—Similar to that of *O. b. bombycinus*, but braincase higher, more arched, much more distended, especially anteriorly; frontal region broader posteriorly.

Measurements.—Type (young): Total length, 218; tail vertebræ, 111, hind foot, 29. *Skull* (type): Greatest length, 28.2; zygomatic breadth, 14.3; interorbital breadth, 5.5; width of braincase, 11.6; nasals, 10.9; anterior palatine foramina, 3.5; palatal bridge 5.5; upper molar series, 4.3.

Remarks.—Cranial comparisons are necessary in order to distinguish this Costa Rican form from *O. b. bombycinus* of Panama. While the interorbital breadth is about the same, the greater anterior expansion of the braincase has resulted in broadening the posterior part of the frontal region.

Specimens examined.—Total number, 4, as follows

Costa Rica: Tuis, 3 (type and topotypes); Guapiles, 1.[1]

Oryzomys devius Group.

Geographic distribution.—High mountains of central Costa Rica to Colombia and Venezuela; altitudinal range from 4,000 to at least 5,000 feet; Humid Upper Tropical Zone (fig. 8).

General characters.—Size very large, but form rather slender; tail much longer than head and body, indistinctly haired; ears rather large, blackish, the short hairs, thinly distributed over inner and outer sides, of about the same color as the epidermis; pelage long, but somewhat rigid; vibrissæ long (about reaching shoulders); hind feet long and narrow, thinly haired above, the plantar surface between the large conspicuous tubercles smooth; toes of hind feet with the slight basal webbing usual in the genus, the longest three tufted with silvery bristles as in *O. talamancæ* and other groups; claws short, recurved, compressed and sharp pointed as in other partially scansorial sections of the genus. Colors dark; upperparts between tawny and russet; underparts varying from ochraceous-tawny to dull white, the basal color plumbeous except in some examples, which tend to exhibit irregular areas on throat where the fur may be pure white to roots.

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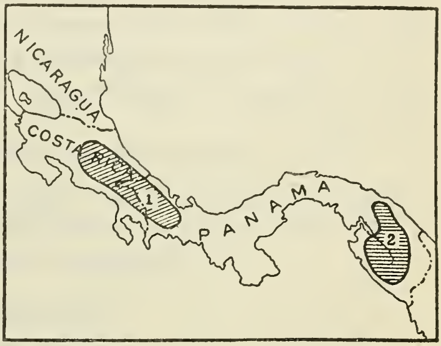
[1] Collection Carnegie Mus.

Skull.—Size very large, with rostrum long and heavy; nasals broad and reaching posteriorly slightly beyond premaxillæ; braincase moderately broad and inflated; zygomata heavy; the maxillary arm extensively overlapping outer side of jugal, in some examples in contact with squamosal, the gap usual in the genus being completely bridged; outer wall of antorbital foramen with projecting upper anterior border rounded, the antorbital notch broad as viewed from above, but less deeply cutting zygoma, the aperture appearing less evenly circular than in the *O. palustris* group; frontal region narrow, especially posteriorly, the anterior median depression rather inconspicuous; lateral margins of frontals smoothly rounded, or rising in slightly upturned ridges; temporal ridges moderately developed, crossing lateral wings of parietals to supraoccipital and continuing thence downward in prominent crests along occipito-squamosal border; interparietal very large, extending transversely nearly across posterior parietal border, pointed-elliptical in outline owing to convexity of anterior margin; anterior palatine foramina very short, not reaching anterior plane of first molars, narrow anteriorly, very broad and gaping widely open posteriorly, palatal pits large and irregular in form; spheno-palatine vacuities absent; interpterygoid fossa moderately broad and extending well forward, the anterior border closely approaching posterior plane of last molars; audital bullæ variable but rather small; angle of mandible broad, the inferior border strongly incurved; coronoid process large and strongly upturned, the high thin connecting ridge extending to near summit of condyle; molars heavy and approaching the *O. talamancæ* type, the crowns of the upper series deeply incised by inner reentrant angles, and of lower series by outer reentrant angles; as in the *talamancæ* group the second upper molar is evenly cleft by inner reentrant angle and lacks



1. *O. devius.* | 2. *O. pirrensis.*

FIG. 8.—Geographic distribution of the *Oryzomys devius* group.

the elongated enamel island extending in the moderately worn crown of *O. palustris* and other groups along the postero-internal base of the paracone; mandibular toothrow very narrow posteriorly, the third molar elongated and deeply cleft by outer reentrant angle.

Remarks.—The *O. devius* group, as it may be called, includes two northern representatives of a widely distributed South American section of the genus which in that country has sometimes been denominated the *O. meridensis* group, from the name of a Venezuelan species.

These northern forms generally lack the irregular but extensive pure white pectoral and inguinal areas exhibited by the allied Venezuelan and Colombian forms *O. meridensis* and *O. maculiventer*, although a tendency to develop them is shown in *O. devius*.

The North American species are externally easily recognizable among their congeners of the general region by the combination of large size with dark color and very long tails. Except for the more hispid pelage they are superficially much like the species of *Peromyscus* (subgenus *Megadontomys*) occurring at the same localities with them.

Key to Species of the O. devius Group.

a^1. Supraorbital ridges prominent. (Eastern Panama.)........**O. pirrensis** (p. 81).
a^2. Supraorbital ridges not prominent. (Western Panama.).......**O. devius** (p. 80).

ORYZOMYS DEVIUS Bangs.

Chiriqui Rice Rat.

(Pl. IV, figs. 1, 1a.)

Oryzomys devius Bangs, Bull. Mus. Comp. Zool., XXXIX, p. 34, figs, 13, 14, April, 1902.

Type locality.—Boquete, Volcan de Chiriqui, Panama (altitude, 5,000 feet).

Type.—No. 10324, ♀ adult, Museum of Comparative Zoology (Bangs collection); collected by W. W. Brown, jr., January 29, 1901.

Geographic distribution.—Forested slopes of high mountains in central Costa Rica and western Panama; altitudinal range from 4,000 to at least 5,000 feet; Humid Upper Tropical Zone.

General characters.—Size large, about as in *O. pirrensis* of eastern Panama, but color slightly paler, more tawny; skull more smoothly rounded; audital bullæ much larger.

Color.—Upperparts dark tawny, inclining toward russet and rather heavily mixed with black along median line of dorsum, becoming light tawny, or in the paler examples dark ochraceous-buffy along lower part of sides; throat whitish (the fur pure white to roots over a small area in one example), rest of underparts overlaid with ochraceous-buffy in three examples and with dull white in the other three examined; nose and ears blackish; feet dull yellowish or light brownish; tail (epidermis) dark brownish above, paler below. *Young* (in first pelage): Upperparts blackish, the tawny element appearing rather inconspicuously along sides; underparts (in single specimen examined) thinly overlaid with dull white.

Skull.—Similar to that of *O. pirrensis*, but more smoothly rounded, the supraorbital and temporal ridges weakly developed or absent; nasals slightly longer, ending posteriorly in plane of lachrymals; zygomata less widely spreading; audital bullæ decidedly larger. Compared with that of *O. meridensis*, the skull is larger, with longer nasals and larger audital bullæ.

Measurements.—Type: Total length, 335; tail vertebræ, 180; hind foot, 33. Two adult topotypes: 345, 360; 185, 195; 36, 35. *Skull* (average of three adults, type, and two topotypes): Greatest length, 36.6 (35.8–37.5); zygomatic breadth, 18.4 (18–19); interorbital breadth, 5.7 (5.5–6); width of braincase, 12.6 (12.2–12.9); nasals, 14.3 (13.8–15); anterior palatine foramina, 5.4 (5.2–5.6); palatal bridge, 7.8 (7.8–7.9); upper molar series, 5.7 (5.6–5.8).

Remarks.—*O. devius* is clearly allied to *O. pirrensis* of eastern Panama, but possesses very distinctive cranial characters, and there is no hint of intergradation. Both are inhabitants of high mountains, and their ranges are apparently separated by the intervening lowlands in the vicinity of the Canal Zone.

Specimens examined.—Total number, 8, as follows:

Costa Rica: Volcan Irazu, 2.[1]
Panama: Boquete, 6 (type and topotypes).[2]

ORYZOMYS PIRRENSIS GOLDMAN.

MOUNT PIRRE RICE RAT.

(Pl. IV, figs. 2, 2a; Pl. V, fig. 9; Pl. VI, figs. 6, 6a.)

Oryzomys pirrensis Goldman, Smiths. Misc. Coll., LX, No. 22, p. 5, February 28, 1913.

Type locality.—Head of Rio Limon, Mount Pirre, Panama (altitude 4,500 feet).

Type.—No. 178993, ♂ adult, United States National Museum (Biological Survey collection); collected by E. A. Goldman, April 29, 1912.

Geographic distribution.—Steep, heavily forested slopes of high mountains at 4,500 feet altitude in eastern Panama, and probably adjacent portions of Colombia; Humid Upper Tropical Zone.

General characters.—Size large, about as in *O. devius* of western Panama, but color slightly darker, more russet; skull more angular; audital bullæ decidedly smaller.

Color.—*Fresh pelage:* Upperparts between tawny and russet, heavily mixed with black along the broad median line from top of head to base of tail, becoming lighter, purer tawny on cheeks, shoulders, and sides; throat whitish or grayish, rest of underparts usually overlaid with ochraceous-tawny, but varying to dull white, the basal color of the fur everywhere deep plumbeous; nose and ears blackish; fore feet blackish, becoming lighter on toes; hind feet dark brown, thinly clothed with short hairs to toes, the toes dull yellowish; epidermis of tail dark brown above, usually somewhat paler below. *Young* (in first pelage): Upperparts darker than in adults, the blackish element in the pelage predominant; underparts with a thinner ochraceous-tawny wash.

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[1] One specimen in Mus. Comp. Zool.

[2] Four specimens in Mus. Comp. Zool.; 2 in Field Mus. Nat. Hist.

Skull.—Similar to that of *O. devius*, but more angular, the supraorbital and temporal ridges well developed; nasals slightly shorter, not reaching posteriorly to plane of lachrymals; zygomata more widely spreading; audital bullæ decidedly smaller. In small size of audital bullæ the skull agrees with those of *O. meridensis* and *O. maculiventer*, but contrasts with both in larger general size and angularity.

Measurements.—Type: Total length, 340; tail vertebræ, 185; hind foot, 38. Average of five adult topotypes: 314 (309–322); 164 (159–170); 35.7 (34–37). *Skull* (average of six adults, type, and five topotypes): Greatest length, 36.8 (34.9–38.5); zygomatic breadth, 19.2 (17.8–20); interorbital breadth, 5.8 (5.5–6); width of braincase, 12.4 (11.8–12.9); nasals, 13.7 (13–14); anterior palatine foramina, 5.8 (5.4–6); palatal bridge, 7.5 (7.3–7.8); upper molar series, 5.7 (5.5–5.9).

Remarks.—In external appearance *O. pirrensis* differs only slightly from *O. devius* of western Panama. The skull, however, combines the large general size of that species with the smaller general dimensions and small audital bullæ of *O. meridensis* and *O. maculiventer;* it differs from both in the development of the supraorbital and temporal ridges. In color of upperparts *O. pirrensis* is similar to the South American species, but the underparts show no trace of the pure white pectoral and inguinal areas which are so conspicuous in the latter forms.

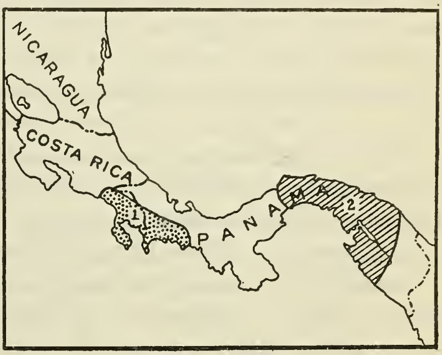
Specimens examined.—Eight, from type locality.

Oryzomys tectus Group.

Geographic distribution.—Southern Costa Rica and southeastward through Panama at least to Colombia and Venezuela; altitudinal range from near sea level to about 5,000 feet (fig. 9).

General characters.—Size large, form rather robust; tail about equal to or somewhat exceeding head and body, scantily haired, the epidermal scales small; ears small, moderately clothed externally and internally with comparatively coarse hairs of general body color; general pelage long, coarse, and rigid; vibrissæ somewhat longer than head; hind feet short and relatively broad, well haired above, the longest three toes bearing conspicuous tufts of silvery bristles, which project beyond ends of claws; claws short, strongly curved, compressed, and sharp-pointed. Color of upperparts between rich tawny and ochraceous-tawny, mixed with black, the tawny element predominating; underparts varying from nearly pure white to warm buff.

Skull.—Size large and angular, with rostrum short and braincase low and flattened; outer wall of antorbital foramen rounded above, the forward projection moderate; nasals short, ending posteriorly in the anterior plane of orbits; premaxillæ about conterminous with nasals posteriorly, the ends slightly expanded, not beveled externally; frontals very broad, the lateral margins overhanging as supraorbital shelves; temporal ridges prominent, extending posteriorly to supraorbital border; mastoid process of squamosal short and stout, owing to slight excision of squamosal margin; interparietal large, pointed-elliptical, the anterior angle well developed; lachrymal very small; anterior palatine foramina short, moderately broad anteriorly and posteriorly, reaching or nearly reaching anterior plane of first molars; palatal pits normally small; sphenopalatine vacuities absent or very small; audital bullæ small; ramus of mandible short, the angle broad; coronoid process broad and strongly hooked, a high trenchant ridge connecting with condyle; tubercle over root of lower incisor large. Molars similar to those of the *O. talamancæ* group; approaching the *O. palustris* type in general characters, but second upper molar with inner lobes more nearly equal in extent (the anterior slightly the larger in *palustris*), and central enamel island present in *palustris* usually fused with enamel fold separating paracone and parastyle; third lower molar more triangular in outline, the posterior lobe narrower and the outer reentrant angle more nearly dividing crown.



1. *O. t. tectus.* | 2. *O. t. frontalis.*

FIG. 9.—Geographic distribution of subspecies of *Oryzomys tectus.*

Remarks.—*O. tectus* is typical of a group including also *O. flavicans*, *O. palmarius*, and other extralimital forms distinguished by rich coloration, coarsely haired ears, and short stout hind feet. In external appearance they are not very unlike some species of *Rhipidomys*, but have shorter, less hairy tails and lack the dark metapodial markings usually present in that genus; in general characters they apparently approach the section assigned to generic rank by Thomas under the name *Œcomys*,[1] but in the more essential respects scarcely exhibit a wider departure from typical *Oryzomys* than several groups usually assigned to the genus.

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[1] Thomas, Oldfield, Ann. Mag. Nat. Hist., ser. 7, XVIII, p. 444, Dec. 1906.

ORYZOMYS TECTUS Thomas.

[Synonymy under subspecies.]

Geographic distribution.—Southern Costa Rica, Panama, and probably adjacent portions of Colombia; vertical range from near sea level to about 2,000 feet, mainly in Arid Lower Tropical Zone.

General characters.—Similar to *O. flavicans* of Venezuela, but larger; color darker; skull larger with laterally expanded frontal region. (For additional general characters see under *O. tectus* group.)

Color.—*Fresh pelage:* General color of upperparts varying shades of tawny and ochraceous-tawny, rather inconspicuously darkened on face, top of head, and back by an admixture of dusky hairs, becoming paler, more ochraceous-buffy on cheeks, shoulders, and sides; underparts varying from near pure white to warm buff; ears clothed internally and externally with short tawny hairs; feet whitish; tail varying from uniform dark brownish all around to dark brownish above, and whitish or yellowish below.

Skull.—Size large, with remarkably broad frontal region. Similar in general to *O. flavicans*, but decidedly larger; frontal region broader, the lateral margins shelving farther over orbits, not strongly upturned as in *flavicans*. (For additional characters see under *O. tectus* group.)

Remarks.—*O. tectus* is clearly allied to *O. flavicans flavicans*, *O. f. illectus*, and *O. palmarius*, all South American forms in which the supraorbital ridges are well developed, but are compressed and not widely expanded and *Tylomys*-like as in the forms of *tectus*. This difference, although rather striking, is a relative instead of absolute character, and close agreement in other essential respects even suggests probable intergradation.

Key to Subspecies of O. tectus.

*a*¹. Upperparts more distinctly tawny. (Western Panama and southern Costa Rica.)..**O. t. tectus** (p. 84).
*a*². Upperparts less distinctly tawny. (Eastern Panama.).....**O. t. frontalis** (p. 85).

ORYZOMYS TECTUS TECTUS Thomas.

BUGABA RICE RAT.

Oryzomys tectus Thomas, Ann. Mag. Nat. Hist., ser. 7, VIII, p. 251, September, 1901.

Type locality.—Bugaba, Chiriqui, Panama (altitude 800 feet).

Type.—No. 0.7.11.43, ♂, British Museum; collected by H. J. Watson, September 15, 1898.

Geographic distribution.—Pacific slope of western Panama and southern Costa Rica at about 800 feet altitude, limits of altitudinal range unknown; Arid Lower Tropical Zone.

General characters.—Closely resembling *O. t. frontalis*, but upperparts richer tawny; underparts more extensively buffy; lips, chin, and throat buffy instead of white as in *frontalis;* skull differing in rather slight details.

Color.—Upperparts near tawny rather thinly mixed with black, general color darkest over dorsum, becoming paler and rich ochraceous-buffy on cheeks and sides; underparts, including lips, chin, and throat overlaid with warm buff; ears clothed with tawny hairs; feet whitish; tail (epidermis and hairs) brownish above, whitish or dull yellowish below to near tip, which is dark all around.

Skull.—Very similar to that of *O. t. frontalis*, but frontals more extended posteriorly on median line between parietals; interparietal smaller.

Measurements.—From original description of type: "Head and body, 140 millim.; tail, 142; hind foot, s. u. 27, c. u. 29.5; ear, 18. *Skull:* Tip of nasals to back of interparietal, 33; greatest breadth, 17; nasals, 11.6 × 4; interorbital breadth, 6.5; palate length, 13.8; diastema 8.1; palatal foramina, 5 × 2.2; length of upper molar series, 4.9." A rather young example from Boruca, Costa Rica: Total length, 258; tail vertebræ, 140; hind foot, 27.

Remarks.—The type of *O. t. tectus* has not been examined by me, but specimens from Boruca, Costa Rica, are believed to be typical. They are distinguished from *O. t. frontalis* of eastern Panama mainly by richer general coloration. No other member of the *O. tectus* group ranges so far into the Central American Subregion.

Specimens examined.—Two, as follows:

Costa Rica: Boruca, 2.

ORYZOMYS TECTUS FRONTALIS GOLDMAN.

COROZAL RICE RAT.

(Pl. IV, figs. 4, 4a; Pl. V, fig. 10; Pl. VI, figs. 7, 7a.)

Oryzomys frontalis Goldman, Smiths. Misc. Coll., LVI, No. 36, p. 6, February 19, 1912.

Type locality.—Corozal, Canal Zone, Panama (altitude 100 feet).

Type.—No. 171531, ♀ adult, United States National Museum (Biological Survey collection); collected by E. A. Goldman, June 20, 1911.

Geographic distribution.—Forested Pacific slope of Panama from the Canal Zone to near Colombian frontier, and probably adjacent Colombian territory; altitudinal range from sea level to about 2,000 feet; Arid and Humid Lower Tropical Zones.

General characters.—Similar in general to *O. t. tectus*, but upperparts duller, less distinctly tawny; underparts less extensively buffy; lips, chin, and throat white instead of buffy as in *tectus;* skull differing in rather slight details.

Color.—Upperparts between tawny and ochraceous-tawny, rather sparingly mixed dorsally with black, the general color becoming paler, purer, and ochraceous-buffy on cheeks and sides; underparts in general white in some examples, thinly overlaid with warm buff across the abdomen in others, the lips, chin, and throat in all specimens examined nearly pure white to roots of hairs; ears and feet as in *O. t. tectus;* tail usually unicolor, dark brownish, but in some examples becoming lighter on under side near base.

Skull.—Closely resembling that of *O. t. tectus,* but frontals less extended posteriorly on median line between parietals; interparietal larger.

Measurements.—Type: Total length, 309; tail vertebræ, 161; hind foot, 30. Average of five adults from Cana, Panama: 288 (281–293); 156 (152–164); 27.8 (26.5–29). *Skull* (average of same): Greatest length, 32.8 (31.1–34.1); zygomatic breadth, 17.1 (16.6–17.5); interorbital breadth, 6.1 (5.3–6.8); width of braincase, 12.2 (12–12.6); nasals, 11.4 (10.5–12.4); anterior palatine foramina, 5.3 (4.9–5.6); palatal bridge, 6.4 (5.6–6.9); upper molar series, 5.2 (4.8–5.3).

Remarks.—Two specimens of *O. t. frontalis* from eastern Panama have been submitted to Mr. Oldfield Thomas, who has kindly compared them with the type and topotypes of *O. t. tectus* in the British Museum. While inclined to regard them as referable to the same form he writes that "they are not quite so rich in colour as our specimens." Two examples from Boruca, Costa Rica, not far from the type locality and in the same general faunal area, and believed to be fairly typical of *tectus,* exhibit a type of coloration and slight cranial details indicating that eastern and western Panama are inhabited by closely allied but easily recognizable forms.

Specimens examined.—Total number, 12, as follows:

Canal Zone: Corozal, 1 (type).
Panama: Cana, 11.

ORYZOMYS VICTUS[1] THOMAS.

ST. VINCENT RICE RAT.

Oryzomys victus Thomas, Ann. Mag. Nat. Hist., ser. 7, I, p. 178, February, 1898.

Type locality.—St. Vincent, Lesser Antilles.

Type.—No. 97.12.26.1, ♀ adult, British Museum; collected by H. H. Smith, presented by F. DuCane Godman.

Geographic distribution.—Known only from St. Vincent.

General characters.—From original description of type: "Size and proportions about as in the larger members of the *O. longicaudatus* group. General colour dark rufous, but evidently affected by the spirit in which the specimen has been preserved. Under surface buffy white, the bases of the hairs slate-colour. Eyes without darker rims. Ears short, the anterior part of their backs brown, not strikingly contrasting with the general colour of the head. Hands and feet thinly clothed with fine silvery hairs. Tail almost naked, brown above, slightly paler below. Mammæ 2–2 = 8."

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[1] Group association undetermined.

Skull.—From original description of type: "Skull with the general shape of the South-American *O. longicaudatus*, the braincase being similarly lengthened as compared with the broadened braincase of the Central-American *O. melanotis* and its allies. Compared with a Rio Janeiro example it is larger, more rounded, the supraorbital edges less sharply square, but the parietal ridges thicker and better developed. Molars larger and stouter, palate ending only just behind the back of m^3."

Measurements.—From original description of type (measured in spirit): "Head and body, 96 millim.; tail, 121; hind foot without claws, 25; with claws, 26.7; ear, 14. *Skull:* Basilar length, 21.4; basal length, 23.8; greatest breadth, 15.1; nasals, 11.2x3.4; interorbital breadth, 4.5; interparietal, 3.2x10; palate length from henselion, 12.3; diastema, 7.8; palatal foramina, 5.4x1.8; length of upper molar series, 4.1."

Remarks.—The type of *O. victus* has not been examined by me. It was originally compared mainly with a South American species, but the true affinities remain to be determined. As in the case of *O. antillarum*, of Jamaica, this rice rat seems likely to be endangered by the presence of the mongoose, if it has not already been exterminated since the introduction of that indiscriminately destructive animal.

Subgenus **OLIGORYZOMYS** Bangs.

Oligoryzomys Bangs, Proc. New England Zool. Club., I, p. 94, February 23, 1900 (subgenus). Type *Oryzomys navus* Bangs.

Geographic distribution.—Southern Mexico south through Central America to undetermined limits in South America.

Subgeneric characters.—Size very small; hind foot usually less than 25; form slender and *Reithrodontomys*-like; ears rather large and coarsely haired; tail much longer than head and body; four longer toes of hind feet bearing tufts of silvery bristles projecting beyond ends of claws.

Skull delicate in structure, smoothly rounded; supraorbital and temporal ridges absent; interorbital region narrow, the constriction about equal to width of rostrum between antorbital foramina; outer wall of antorbital foramen projecting slightly forward, as viewed from above; angle of mandible placed well within vertical plane of condyle; molars with small accessory cusps present as in subgenus *Oryzomys*, but reentrant angles usually broader, the salient angles formed by worn crowns of tubercles less evenly rounded; upper molars early exhibiting small, circular central enamel islands which persist until obliterated by wear in extreme old age; second upper molar with protocone and hypocone of about equal size, the inner reentrant angle central in position; third lower molar with outer reentrant angle extending less than halfway across crown; tubercle over root of lower incisor large.

Remarks.—The subgenus *Oligoryzomys* includes a series of forms easily distinguishable among their North American congeners by diminutive size and external resemblance to species of the genus *Reithrodontomys*. *Oligoryzomys*, however, departs from the subgenus *Oryzomys*, as currently restricted, mainly in a combination of relative rather than absolute characters. The molar crowns differ in details of enamel arrangement, the second upper especially, in the early appearance of a single, persistent, normally circular enamel island in the broad central space between the apex of the inner reentrant angle and the base of the paracone. In the subgenus *Oryzomys* this molar crown varies in pattern; the more typical forms normally present, in early stages of wear, an elongated, crescentic enamel island in the central space, but in more divergent forms the enamel island may be absent or tend to unite with the long, deep enamel fold between the paracone and parastyle. Several groups seem at least as fully entitled to subgeneric recognition as *Oligoryzomys*, but the problem of further subgeneric divisions can best be solved when more comprehensive study of the genus is undertaken.

ORYZOMYS FULVESCENS (SAUSSURE).

[Synonomy under subspecies.]

Geographic distribution.—From southern Mexico south through Guatemala, Honduras, Nicaragua, and Costa Rica to Panama, and probably portions of Colombia; altitudinal range from near sea level to about 5,500 feet; mainly Arid and Humid Lower Tropical Zones (fig. 10).

General characters.—(See subgeneric characters under subgenus *Oligoryzomys*.)

Color.—Upperparts varying from light ochraceous-buff to ochraceous-buff or tawny, most intense on rump, palest and purest on cheeks, shoulders, and sides; the face, top of head, and back moderately darkened by blackish hairs; underparts varying from nearly pure white in general to light ochraceous-buff on abdomen, inguinal region, and inner sides of hind limbs; the lips, throat, and fore limbs white; outer sides of ears blackish, inner sides clothed with ochraceous-buffy hairs; vibrissæ black (about as long as head); feet white, the hind feet with tufts of silvery hairs projecting beyond claws of longest four digits; tail dark brownish above, lighter brown or yellowish below, except toward tip, which is dusky all around. *Young* (in first pelage): Usually darker than adults, the ochraceous-buff or tawny element less developed.

Skull.—(See subgeneric characters under subgenus *Oligoryzomys.*)

Remarks.—The North American forms of the subgenus are all referable to a single species whose range probably extends well into South America. They agree closely among themselves in essential characters, and by small size and slender form are sufficiently distinguished from other sections of the genus inhabiting the same region.

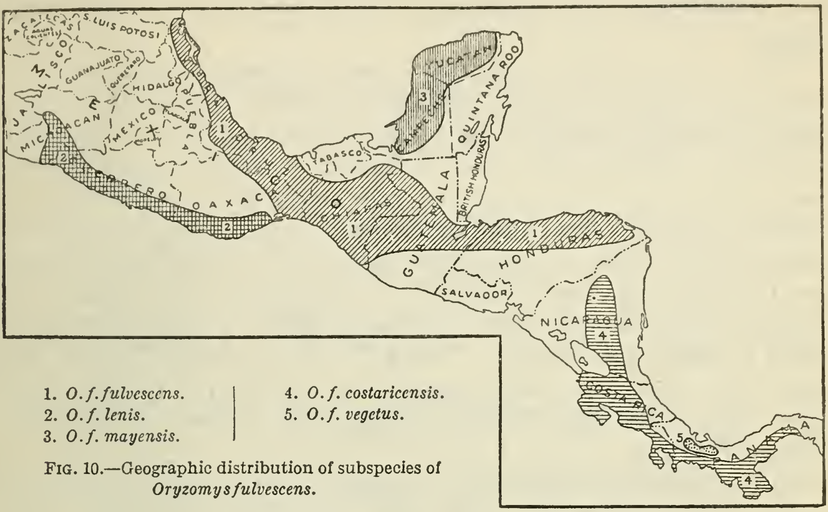

FIG. 10.—Geographic distribution of subspecies of *Oryzomys fulvescens.*

Key to Subspecies of O. fulvescens.

a^1. Size smaller; hind foot less than 24.
  b^1. Upperparts darker ochraceous-buff.
    c^1. Upper molar series shorter. (Southern Tamaulipas; eastern Oaxaca; Chiapas; northern Honduras.) .... **O. f. fulvescens** (p. 89).
    c^2. Upper molar series longer. (Southwestern Panama; Costa Rica; Nicaragua.) **O. f. costaricensis** (p. 92).
  b^2. Upperparts paler ochraceous-buff.
    c^1. Skull broader; zygomatic breadth 11.5 or more. (Michoacan; Guerrero; southern Oaxaca.) .... **O. f. lenis** (p. 91).
    c^2. Skull narrower; zygomatic breadth less than 11.5. (Yucatan; Campeche.) **O. f. mayensis** (p. 92).
a^2. Size larger; hind foot 24 or more. (Mountains of western Panama.) **O. f. vegetus** (p. 93).

ORYZOMYS FULVESCENS FULVESCENS (SAUSSURE).

VERA CRUZ PYGMY RICE RAT.

[Pl. IV, figs. 5, 5a; Pl. V, figs. 2, 11; Pl. VI, figs. 8, 8a.]

Hesperomys fulvescens Saussure, Rev. et Mag. Zool., ser. 2, XII, p. 102, March, 1860.
Oryzomys fulvescens Allen and Chapman, Bull. Amer. Mus. Nat. Hist., IX, p. 204, June 16, 1897.

Type locality.—Orizaba,[1] Vera Cruz, Mexico.

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[1] Type locality fixed by Merriam, Proc. Washington Acad. Sci., III, p. 295, July 26, 1901.

Type.—In Geneva Museum of Natural History.

Geographic distribution.—Southern Tamaulipas, Vera Cruz, eastern Oaxaca, Chiapas, and east through central Guatemala to eastern Honduras; altitudinal range from near sea level to about 5,500 feet; mainly Arid and Humid Lower Tropical Zones.

General characters.—Size small; molar tooth series short. Similar to *O. f. lenis* but upperparts darker ochraceous-buff, the general tone less yellowish; skull narrower and less massive. Size about as in *O. f. costaricensis*, but upperparts usually less tawny; molar series shorter.

Color.—*Fresh pelage:* Upperparts near ochraceous-buff, most intense and in some examples suffused with tawny on rump, palest and purest on cheeks, shoulders, and sides; the face, top of head, and back moderately darkened by blackish hairs; underparts varying from nearly pure white throughout in rare examples to warm buff on abdomen, inguinal area, and inner sides of hind limbs, the white appearing only on lips, chin, and inner sides of hind limbs; outer sides of ears blackish, inner sides clothed with ochraceous-buffy hairs; feet whitish; tail brownish above, yellowish below, except toward tip, which is dusky all around. *Young* (in first pelage): Darker than adults, the ochraceous-buff of upperparts restricted to narrow tips of hairs, thus permitting plumbeous basal color to show through and alter general tone.

Skull.—About like that of *O. f. costaricensis*, but molar tooth series shorter. Contrasted with *O. f. lenis*, the skull is narrower, with less widely spreading zygomata; maxillary arms of zygomata and ascending branches of premaxillæ less broad and heavy.

Measurements.—Average of 10 adults from Orizaba, Vera Cruz: Total length, 174.7 (168–205); tail vertebræ, 107.1 (96–118); hind foot, 22 (21–23). *Skull* (average of same): Greatest length, 21.9 (21.1–22.5); zygomatic breadth, 11.5 (11–11.7); interorbital breadth, 3.5 (3.4–3.9); width of braincase, 9.5 (9.3–9.8); nasals, 7.9 (7.6–8.3); anterior palatine foramina, 3.5 (3.3–3.6); palatal bridge, 3.7 (3.5–4); upper molar series, 2.9 (2.9–3).

Remarks.—The differential characters are rather slight, and *O. f. fulvescens* may safely be assumed to intergrade with *O. f. lenis* near the Pacific coast in the vicinity of the Isthmus of Tehuantepec, with *O. f. costaricensis* in eastern Honduras or western Nicaragua, and with the paler form inhabiting the Yucatan Peninsula, in southern Campeche. A single specimen from Patuca, Honduras, the only one available from that country, has a short molar series and seems referable to the subspecies *fulvescens*, the known range of which is thus materially extended eastward from western Guatemala.

Specimens examined.—Total number, 73, as follows:

Chiapas: Huehuetan, 4; Ocuilapa, 1; Tumbala, 11; Yajalon, 1.
Guatemala: Jacaltenango, 3; Nenton, 1.

Honduras: Patuca, 2.
Oaxaca: Santo Domingo (mountains near), 2; Tuxtepec, 1.
Tamaulipas: Alta Mira, 1.
Vera Cruz: Jalapa, 24;[1] Jico, 2; Mirador, 1; Orizaba (type locality by fixation), 17; Pasa Nueva, 1;[2] Santiago Tuxtla, 1.

ORYZOMYS FULVESCENS LENIS Goldman.

Los Reyes Pygmy Rice Rat.

(Pl. IV, figs. 6, 6a.)

Oryzomys fulvescens lenis Goldman, Proc. Biol. Soc. Washington, XXVIII, p. 130, June 29, 1915.

Type locality.—Los Reyes, Michoacan, Mexico.

Type.—No. 125941, ♂ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, February 14, 1903.

Geographic distribution.—Coastal plains and basal mountain slopes in Michoacan, Guerrero, and Oaxaca; altitudinal range from near sea level to about 3,000 feet, mainly in Arid Lower Tropical Zone.

General characters.—Similar to *O. f. fulvescens*, but upperparts paler ochraceous-buff, the general tone more yellowish; skull broader and more massive.

Color.—*Fresh pelage:* Upperparts between ochraceous-buff and light ochraceous-buff becoming warm buff on cheeks, shoulders, and lower part of sides; the face, top of head, and back sparingly lined with dark hairs; underparts, ears, feet, and tail as in *O. f. fulvescens*.

Skull.—Broader than that of *O. f. fulvescens;* zygomata more widely spreading; maxillary arms of zygomata and ascending branches of premaxillæ broader and heavier; dentition rather heavy, but equaled in some examples of *O. f. fulvescens*.

Measurements.—Type: Total length, 198; tail vertebræ, 115; hind foot, 23. Adult topotype: 188; 115; 23. Skull (type and adult topotype): Greatest length, 22.6, 21.8; zygomatic breadth, 12.3, 11.9; interorbital breadth, 3.4, 3.5; width of braincase, 10, 10.3; nasals, 8.6, 7.8; anterior palatine foramina, 3.9, 3.5; palatal bridge, 4.1, 3.7; upper molar series, 3, 3.

Remarks.—The general distribution area of *O. fulvescens* is divided north of the Isthmus of Tehuantepec by the high, interior plateau region, the western arm representing the range of *O. f. lenis*. Specimens from Guerrero and Oaxaca approach subspecies *fulvescens* in characters.

Specimens examined.—Total number, 4, as follows:

Guerrero: Ometepec (near), 1.
Michoacan: Los Reyes, 2 (type and topotypes).
Oaxaca: Pluma, 1.

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[1] Sixteen in Amer. Mus. Nat. Hist.; 2 in Mus. Comp. Zool.

[2] Collection Amer. Mus. Nat. Hist.

ORYZOMYS FULVESCENS MAYENSIS, SUBSP. NOV.

MAYA PYGMY RICE RAT.

Type locality.—Apazote (near Yohaltum), Campeche, Mexico (altitude 200 feet).

Type.—No. 107979, ♂ adult, United States National Museum (Biological Survey collection); collected by E. W. Nelson and E. A. Goldman, January 5, 1901. Original number 14405.

Geographic distribution.—Peninsula of Yucatan and Campeche; altitudinal range from near sea level to about 300 feet; Arid Lower Tropical Zone.

General characters.—Similar to *O. f. fulvescens*, but paler colored; skull slightly narrower.

Color.—*Fresh pelage:* Upperparts near ochraceous-buff shading toward light ochraceous-buff, darkest and rather sparingly lined with black over dorsum, becoming clearer and paler on cheeks, shoulders, and sides; underparts, ears, feet, and tail as in *O. f. fulvescens*.

Skull.—About like that of *O. f. fulvescens*, but zygomata and braincase slightly narrower.

Measurements.—Type: Total length, 177; tail vertebræ, 101, hind foot, 22. Average of three adult topotypes: 189 (184–196); 113 (108–119); 23 (22–24). *Skull* (average of three adults, type and two topotypes): Greatest length, 21.1 (20.4–21.8); zygomatic breadth, 11 (10.8–11.2); interorbital breadth, 3.6 (3.5–3.8); width of braincase, 9 (8.9–9.1); nasals, 8.1 (7.4–8.4); anterior palatine foramina, 3.3 (3.1–3.5); palatal bridge, 4 (3.6–4.4); upper molar series, 2.9 (2.9–3).

Remarks.—The pale color of this form seems to be due to the same environmental conditions that have been operative in the evolution of pallid races in other mammalian groups inhabiting Yucatan. In this region pale coloration is apparently associated with the arid climate and white limestone formation, outcropping or thinly overlaid with soil over large areas which have risen less than 300 feet above the level of the sea. At Chichen Itza the pygmy rice rat was taken in the vicinity of imposing Maya Indian ruins, a circumstance that suggested the subspecific name.

Specimens examined.—Total number, 7, as follows:

Campeche: Apazote, 4 (types and topotypes).
Yucatan: Chichen Itza, 1; Tunkas, 2.

ORYZOMYS FULVESCENS COSTARICENSIS ALLEN

COSTA RICAN PYGMY RICE RAT.

Oryzomys costaricensis Allen, Bull. Amer. Mus. Nat. Hist., V, p. 239, September 22, 1893.

Oryzomys (*Oligoryzomys*) *nicaraguæ* Allen, Bull. Amer. Mus. Nat. Hist., XXVIII, p. 100, April 30, 1910. Type from Vijagua, Nicaragua, No. 29543, ♂ ad., Amer. Mus. Nat. Hist.; collected by W. B. Richardson, March 24, 1909.

Type locality.—El General, Costa Rica (altitude, 2,150 feet).

Type.—No. $\frac{9581}{7923}$, ♀ subadult, American Museum of Natural History, collected by H. Pittier, February, 1891.

Geographic distribution.—Southwestern Panama east to Canal Zone, Costa Rica, and north to northern Nicaragua; altitudinal range from near sea level to at least 2,000 feet.

General characters.—Similar to *O. f. fulvescens*, but upperparts usually more tawny; molars larger. Also similar to *O. f. vegetus*, but smaller and averaging paler.

Color.—About as in *O. f. fulvescens*, but upperparts usually more distinctly tawny.

Skull.—Closely resembling that of *O. f. fulvescens*, but molars larger, the toothrows decidedly longer. General size smaller than that of *O. f. vegetus*; molars about the same.

Measurements.—Two adults from Buenos Aires, Costa Rica: Total length, 183, 190; tail vertebræ, 100, 108; hind foot, 20, 23. *Skull* (same): Greatest length, 21.1, 21.5; zygomatic breadth, 11.4, 11.4; interorbital breadth, 3.7, 3.7; width of braincase, 9.9, 9.6; nasals, 8.2, 8; anterior palatine foramina, 3.6, 3.7; palatal bridge, 4, 4.2; upper molar series, 3.2, 3.2.

Remarks.—The general dimensions of *O. f. costaricensis* are about the same as those of *O. f. fulvescens*; the color difference is slight but the upperparts are usually more distinctly tawny. The most distinctive feature seems to be the larger molars and resulting elongation of the toothrows, a character shared with the larger and darker form *O. f. vegetus*. "*O. nicaraguæ*" was based on scanty material from Nicaragua which is not satisfactorily separable from *costaricensis*. The type, apparently full grown but with molars rather slightly worn, is not so tawny as most examples of *costaricensis*, but this color element is usually less distinct in younger individuals. The toothrows are long, as in *costaricensis*.

Specimens examined.—Total number, 19, as follows:

Costa Rica: Boruca, 7;[1] Buenos Aires, 2;[2] Cerro de Buena Vista, 1;[2] El General, 3 (type and topotypes);[2] La Carpintera, 1.[2]

Nicaragua: San Rafael del Norte, 1;[2] Vijagua, 1 (type of "*nicaraguæ*").[2]

Panama: La Chorrera, 1;[2] Old Panama, 2.[2]

ORYZOMYS FULVESCENS VEGETUS Bangs.

Volcan Chiriqui Pygmy Rice Rat.

Oryzomys (*Oligoryzomys*) *vegetus* Bangs, Bull. Mus. Comp. Zool., XXXIX, text fig. 15, p. 35, April, 1902.

Type locality.—Boquete, Volcan de Chiriqui, Panama (altitude, 4,000 feet).

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[1] Six in Amer. Mus. Nat. Hist.; 1 in Field Mus. Nat. Hist.

[2] Collection Amer. Mus. Nat. Hist.

Type.—No. 10298, ♀ old adult, Museum of Comparative Zoology (Bangs collection); collected by W. W. Brown, jr., April 16, 1901.

Geographic distribution.—Known only from the vicinity of type locality; Upper Tropical Zone.

General characters.—Size larger and color usually darker than in *O. f. costaricensis;* skull larger, but molar teeth relatively small.

Color.—About as in *O. f. fulvescens* and *O. f. costaricensis*, but general tone averaging darker than either, the tawny element in upperparts distinct as in *costaricensis;* abdomen varying in the darkest examples to a shade darker than light ochraceous-buff of Ridgway.

Skull.—Decidedly larger than that of *O. f. costaricensis*, with molar teeth actually about the same size, therefore relatively smaller.

Measurements.—Type: Total length, 210; tail vertebræ, 120; hind foot, 25. Average of six adult topotypes: 216 (205–235); 122 (115–130); 24.2 (24–25). *Skull* (average of 5 adults—type and 4 topotypes): Greatest length, 23.6 (22.7–24.3); zygomatic breadth, 12.3 (11.9–12.8); interorbital breadth, 3.8 (3.7–4.2); width of braincase, 10.3 (10–10.5); nasals, 8.7 (8.3–9.3); anterior palatine foramina, 3.6 (3.4–3.9); palatal bridge, 3.9 (3.8–4.3); upper molar series, 3.1 (3.1–3.1).

Remarks.—Larger average size and tendency toward darker coloration usually distinguish *O. f. vegetus* from the more northern forms of the group, but there seems to be no sharp line of demarcation between it and *O. f. costaricensis.* Both share the heavier dentition as compared with *O. f. fulvescens.* Four specimens in the topotype series were referred by Bangs to *costaricensis.* They are the paler examples and in color apparently do not differ from *costaricensis*, but the larger size of the skulls indicates that they belong with the remainder of the series of *vegetus.*

Specimens examined.—Twenty-two,[1] from type locality.

Subgenus **MELANOMYS** Thomas.

Melanomys Thomas, Ann. Mag. Nat. Hist., ser. 7, X, p. 248, Sept., 1902; Novitates Zool., X, no. 1, p. 41, Apr. 20, 1903 (subgenus). Type *Oryzomys phæopus* Thomas.

Melanomys Allen, Bull. Amer. Mus. Nat. Hist., XXXII, p. 533, Nov. 17, 1913 (genus).

Geographic distribution.—Andean region of northwestern South America from southern Ecuador to northern Colombia, and northwestward through Panama and Costa Rica to northern Nicaragua; altitudinal range from near sea level to about 8,000 feet; mainly in Upper and Lower Tropical Zones.

Subgeneric characters.—Color very dark, upperparts and underparts not strongly contrasted; form robust; tail about three-fourths length of head and body, black all around; feet (epidermis and hair) blackish to base of claws, which are light horn color; hind feet broad, stout, the digital bristles not projecting beyond ends of claws.

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[1] Fifteen in Mus. Comp. Zool.; 7 in Field Mus. Nat. Hist.

Skull rotund; rostrum short, nearly straight; braincase large and inflated; frontals broad, the lateral margins projecting as supraorbital shelves; zygomata slender, but maxillary root decidedly expanded above along frontal and premaxillary sutures; antorbital foramen rather narrow above, but little compressed and opening widely below, the outer wall projecting slightly forward as viewed from above; lachrymal articulating mainly with maxilla; mastoid process of squamosal short and broad owing to slight excision of squamosal border. Molars slightly hypsodont; parastyle and protocone of first upper molar with oblique commissures; secondary parastyle rudimentary or fused with main element; incisors thin and weak, the upper ones descending about perpendicularly from premaxillæ, the points not decidedly curved backward.

Remarks.—This group of dark-colored forms, segregated by Thomas under the name *Melanomys* as a subgenus of *Oryzomys*, was elevated to generic rank by Allen in 1913. In general characters, and especially dentition, however, it approaches typical *Oryzomys* so closely that subgeneric recognition seems better to express the relationship. The most notable dental differences appear to be shown in the rather high molar crowns, comparatively straight, thin upper incisors, and the tendency toward suppression of the secondary parastyle normally present in typical *Oryzomys*. The secondary parastyle is normally fused with the parastyle, which is correspondingly enlarged. Among the more important cranial details are the expansion of the maxillary root of the zygoma over the antorbital foramen and the resulting alteration in the position of the lachrymal as compared with typical *Oryzomys*. The lachrymal in *Melanomys* articulates almost entirely with the maxilla, its position being anterior to the fronto-maxillary suture, while in typical *Oryzomys* it bridges this suture and about evenly overlaps the maxilla and frontal.

The subgenus *Melanomys* differs so strikingly from the subgenus *Oligoryzomys* in appearance that no close comparison is necessary, although most of the characters of the latter are found in varying combinations in the subgenus *Oryzomys*.

ORYZOMYS CALIGINOSUS (Tomes).

Hesperomys caliginosus Tomes, Proc. Zool. Soc. London, 1860, p. 263. Type from coast of Ecuador, probably Esmeraldas.[1] Type No. 7.1.1.128, British Museum; collected by Louis Fraser.

Akodon caliginosus Allen, Bull. Amer. Mus. Nat. Hist., XIV, p. 45, Jan. 31, 1901.

Hesperomys (*Melanomys*) *caliginosus* Thomas, Ann. Mag. Nat. Hist. ser. 8, XI, p. 406, Apr. 1913.

Melanomys caliginosus caliginosus [et al. subsp.] Allen, Bull. Amer. Mus. Nat. Hist., XXXII, p. 537, Nov. 17, 1913.

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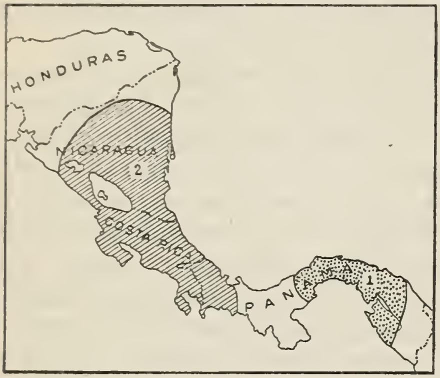
[1] See Allen (op. cit., pp. 533-554, 1913) for locality and revision of group regarded as generically distinct.

Geographic distribution.—(See under subgenus *Melanomys*) (fig. 11).

General characters.—(See subgeneric characters under subgenus *Melanomys*.)

Color.—*Fresh pelage:* Upperparts varying from tawny to russet, abundantly but finely mixed with black, the black tending to become predominant especially on rump; underparts overlaid with varying shades from dark ochraceous-tawny to cinnamon brown, the dark plumbeous basal color showing through; vibrissæ black, scarcely reaching posteriorly to ears; ears, feet, and tail thinly clothed with short hairs, the hairs and epidermis blackish. *Young* (in first pelage): Similar to adults, but upperparts usually more distinctly blackish, and underparts less heavily overlaid with ochraceous-tawny or cinnamon brown.



1. *O. c. idoneus.* | 2. *O. c. chrysomelas.*

FIG. 11.—Geographic distribution of subspecies of *Oryzomys caliginosus* (exclusive of South American forms).

Skull.—(See subgeneric characters under subgenus *Melanomys*.)

Remarks.—In a revision of the "*Melanomys*" group, Allen[1] assigns the component parts to several specific types on the basis of characters which seem comparatively unimportant; the slight departures exhibited either in color or cranial details, in examples from widely separated regions, point to the probable inclusion of most, if not all, of the forms in the species *O. caliginosus*. Two subspecies range within the limits of the region under review.

Key to Subspecies of O. caliginosus (Exclusive of South America).

a^1. Upperparts tending toward tawny; frontal region narrower. (Eastern Panama.) **O. c. idoneus** (p. 96).

a^2. Upperparts tending toward russet; frontal region broader. (Western Panama; Costa Rica; Nicaragua.) .... **O. c. chrysomelas** (p. 97).

ORYZOMYS CALIGINOSUS IDONEUS GOLDMAN

CERRO AZUL DUSKY RICE RAT.

(Pl. IV, figs. 7, 7a; Pl. V, figs. 3, 12; Pl. VI, figs. 9, 9a.)

Oryzomys idoneus Goldman, Smiths. Misc. Coll., LVI, No. 36, p. 5, January 19, 1912.

Melanomys idoneus Allen, Bull. Amer. Mus. Nat. Hist., XXXII, p. 548, November 17, 1913.

Type locality.—Cerro Azul, near headwaters of Chagres River, Panama (altitude, 2,500 feet).

Type.—No. 171106, ♀ adult, United States National Museum (Biological Survey collection); collected by E. A. Goldman, March 26, 1911.

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[1] See Allen (op.cit., pp. 533–554, 1913) for locality and revision of group regarded as generically distinct.

Geographic distribution.—Heavily forested mountain slopes in eastern Panama; known altitudinal range from 1,800 to 2,800 feet; Humid Lower Tropical Zone.

General characters.—Similar to *O. c. caliginosus*, of Ecuador, but upperparts paler, more tawny, instead of russet in color. Closely resembling *O. c. chrysomelas*, but color paler; skull narrower between orbits.

Color.—*Fresh pelage:* Upperparts near tawny (becoming most intense in worn pelage), heavily and finely mixed with black, the mixture usually uniform, but black predominating on rump in some examples; underparts, including inner sides of limbs, dark ochraceous-tawny; inner sides of ankles black; ears, feet, and tail thinly clothed with short hairs, the hairs and epidermis blackish. *Young* (in first pelage): Upperparts usually more distinctly blackish than adults, the tawny element restricted to narrower tips of hairs.

Skull.—Similar to that of *O. c. caliginosus*, but frontal region narrower; molars slightly larger, the toothrows longer; anterior palatine foramina usually shorter. Closely resembling that of *O. c. chrysomelas*, but frontal region more constricted, the supraorbital borders less projecting laterally.

Measurements.—Type: Total length, 218; tail vertebræ, 88; hind foot, 30. Average of 10 adults from Cana, Panama: 217.9 (196–240); 93.3 (85–105); 26.7 (26–27.5). *Skull* (average of same): Greatest length, 30.1 (28.6–30.3); zygomatic breadth, 16.2 (15.1–16.7); interorbital breadth, 6.3 (5.9–6.5); width of braincase, 11.8 (11.2–12.3); nasals, 11.4 (10.7–12.6); anterior palatine foramina, 4.6 (4.4–5); palatal bridge, 6.1 (5.4–6.8); upper molar series, 4.7 (4.4–5).

Remarks.—While *O. c. idoneus* differs from typical *O. c. caliginosus* very appreciably in color, close relationship is evidenced in cranial characters, some skulls being scarcely distinguishable. In color it closely approaches *O. c. columbianus*, of the Santa Marta region of Colombia, but is slightly darker; the tail is usually shorter. In cranial characters similarity to *columbianus* is also shown, but the ascending branches of the premaxillæ are narrower posteriorly, the ends externally beveled in outline along the interdigitating frontopremaxillary line of contact.

Specimens examined.—Total number, 47, as follows:

Panama: Cana, 46; Cerro Azul, 1 (type).

ORYZOMYS CALIGINOSUS CHRYSOMELAS (ALLEN).

COSTA RICAN DUSKY RICE RAT.

(Pl. IV, figs. 8, 8a.)

Hesperomys (*Habrothrix*) *caliginosus* Allen, Bull. Amer. Mus. Nat. Hist., III, p. 210, Apr. 17, 1891 (Costa Rica).

Oryzomys chrysomelas Allen, Bull. Amer. Mus. Nat. Hist., IX, p. 37, Mar. 11, 1897.

Oryzomys (*Melanomys*) *chrysomelas* Allen, Bull. Amer. Mus. Nat. Hist., XXIV, p. 654, Oct. 13, 1908 (Nicaragua).

Zygodontomys chrysomelas Bangs, Bull. Mus. Comp. Zool., XXXIX, p. 37, April, 1902 (Panama).

Melanomys chrysomelas Allen, Bull. Amer. Mus. Nat. Hist., XXXII, p. 547, Nov. 17, 1913.

Zogodontomys (*sic*) *chrysomelas* Allen, Bull. Amer. Mus. Nat. Hist., XXXII, p. 547, Nov. 17, 1913.

Type locality.—Suerre, Costa Rica (altitude probably between 3,000 and 4,000 feet).

Type.—No. $\frac{10707}{9076}$, ♂ adult, American Museum of Natural History; collected by Anastasio Alfaro, July 16, 1895.

Geographic distribution.—Western Panama, Costa Rica, and north to northern Nicaragua; altitudinal range from near sea level to about 3,000 feet, mainly in Humid Lower Tropical Zone.

General characters.—Most closely allied to *O. c. idoneus*, but slightly darker in color; skull broader between orbits.

Color.—About as in *O. c. idoneus*, but rufescent element in upperparts darker and inclining toward the russet tone of the paler species of *O. c. caliginosus.*

Skull.—Similar to that of *O. c. idoneus*, but frontal region less constricted, the supraorbital borders more projecting laterally.

Measurements.—Average of five adults from Escondido River (45 miles from Bluefields), Nicaragua: Total length, 210 (202–217); tail vertebræ, 89 (87–90); hind foot, 25.9 (25–27). *Skull* (average of four adults from same locality): Greatest length, 29.1 (28.2–29.5); zygomatic breadth, 15.9 (15.8–16.1); interorbital breadth, 6.6 (6.3–6.8); width of braincase, 11.8 (11.4–12.2); nasals, 10.9 (10.1–11.5); anterior palatine foramina, 4.9 (4.8–5.1); palatal bridge, 5.6 (5.3–5.8); upper molar series, 4.5 (4.3–4.7).

Remarks.—The range of *O. c. chrysomelas* marks the northern limit of the species in Central America. The Costa Rican subspecies is most closely allied to its near geographic neighbor in eastern Panama, although in color the darker specimens approach some of the paler examples of *O. c. caliginosus* and other South American forms.

Specimens examined.—Total number, 61, as follows:

Costa Rica: Pacuare, 5; Port Limon, 1; San Carlos, 1;[1] Suerre, 5 (type and topotypes);[2] Talamanca (probably near Sipurio), 4.

Nicaragua: Chontales, 3;[1] Escondido River (45–50 miles from Bluefields), 14; Greytown, 1; Savala, 2;[1] Pena Blanca, 3;[1] Rio Coco, 3;[1] Rio Grande, 1;[1] Rio Tuma 5;[1] Tuma, 6:[1] Vijagua, 6.[1]

Panama: Mosca, 1.

PLATE I.

[All subgenus *Oryzomys*. Natural size; all in U. S. Nat. Mus., Biological Survey collection, except figs. 2, 2*a*.]

FIGS. 1, 1*a*. *Oryzomys palustris palustris* (Harlan). Georgetown, South Carolina. ♂ adult. (No. 71367.)
2, 2*a*. *Oryzomys palustris coloratus* Bangs. Type. Cape Sable, Florida. ♂ adult. (No. 4470, Mus. Comp. Zool.)
3, 3*a*. *Oryzomys couesi couesi* (Alston). Yaruca, Honduras. ♂ adult. (No. 131814.)
4, 4*a*. *Oryzomys couesi regillus* Goldman. Type. Los Reyes, Michoacan. ♂ adult. (No. 125945.)
5, 5*a*. *Oryzomys couesi aquaticus* Allen. Topotype. Brownsville, Texas. ♂ adult. (No. 65066.)
6, 6*a*. *Oryzomys gatunensis* Goldman. Type. Gatun, Canal Zone. ♂ young. (No. 171034.)
7, 7*a*. *Oryzomys cozumelæ* Merriam. Type. Cozumel Island, Mexico. ♂ adult. (No. 108462.)
8, 8*a*. *Oryzomys peninsulæ* Thomas. San Jose del Cabo, Lower California. ♀ adult. (No. 146618.)

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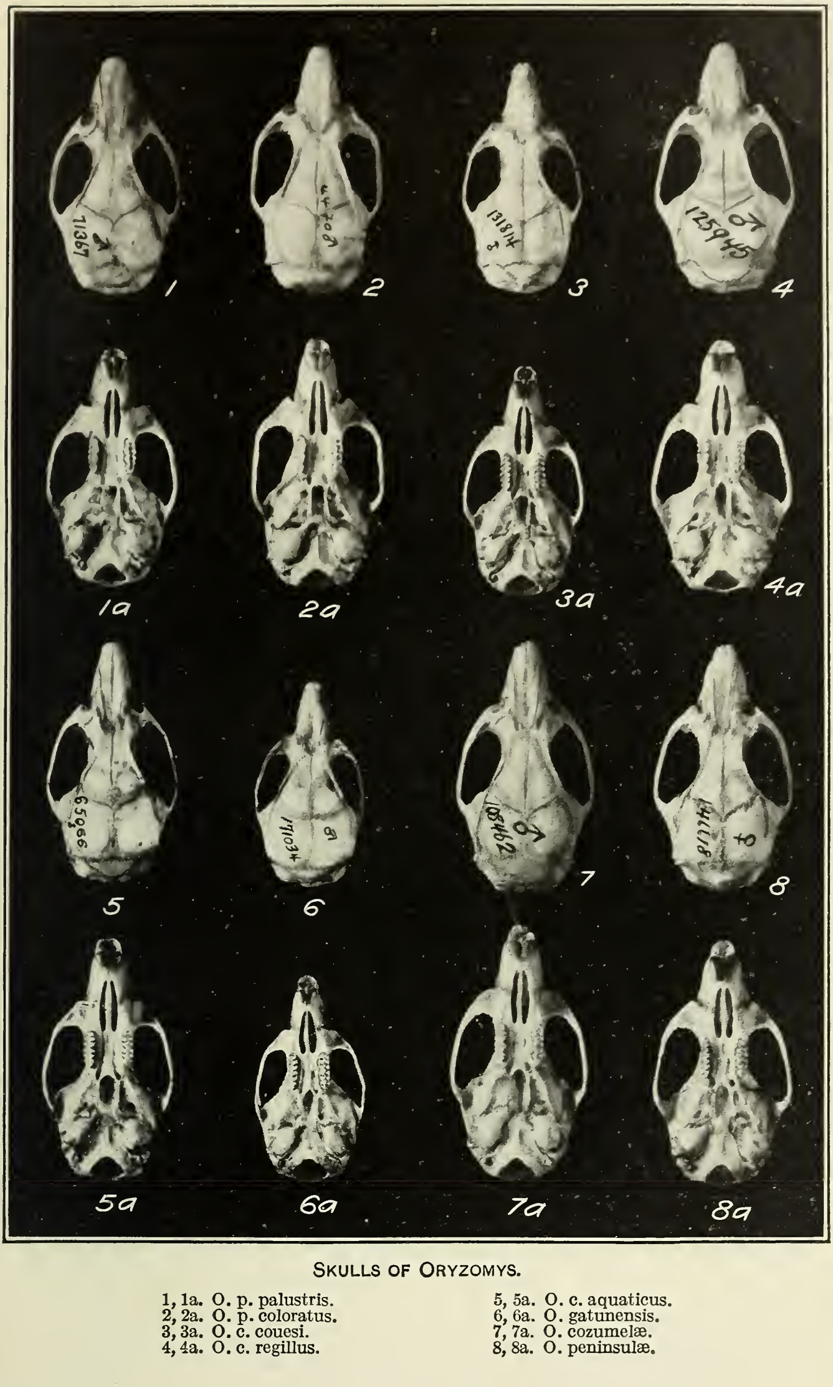
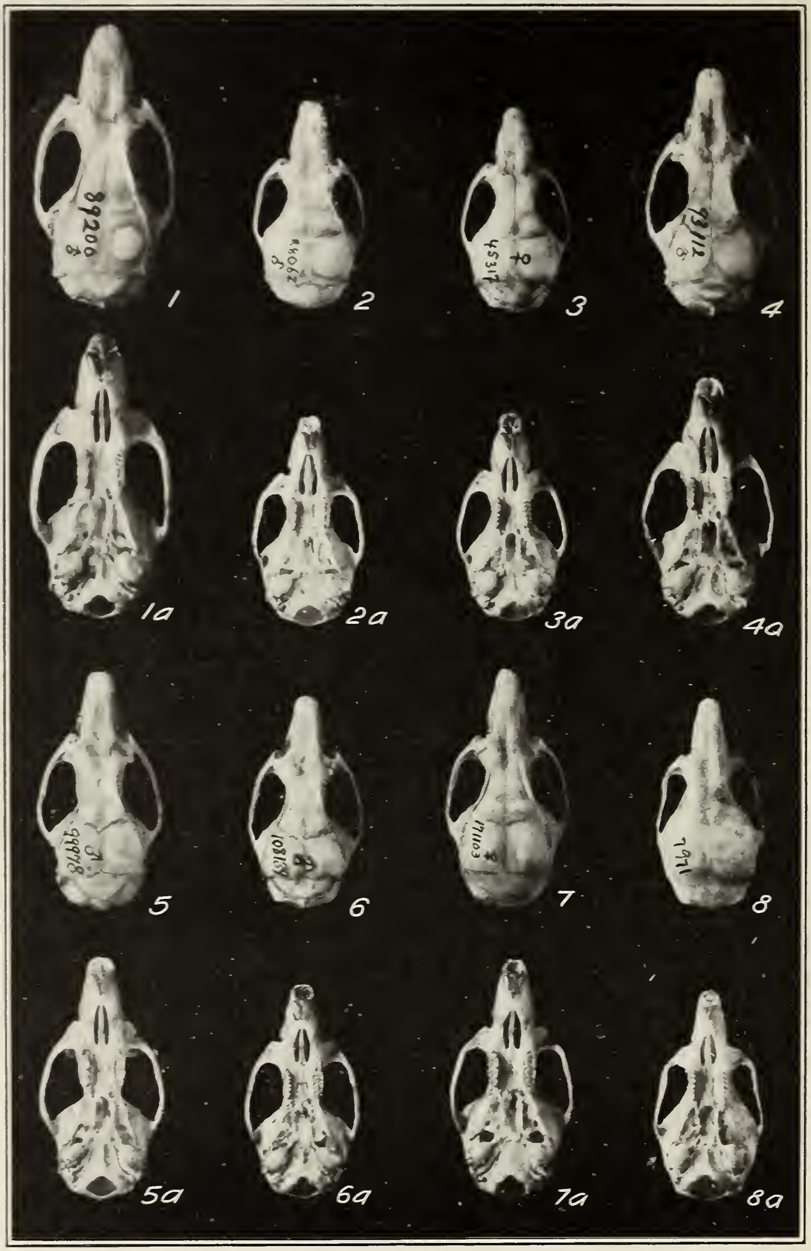
[1] Collection Amer. Mus. Nat. Hist.

[2] Four (including type) in Amer. Mus. Nat. Hist.; 1 in Field Mus. Nat. Hist.



SKULLS OF ORYZOMYS.

1, 1a. O. p. palustris.
2, 2a. O. p. coloratus.
3, 3a. O. c. couesi.
4, 4a. O. c. regillus.
5, 5a. O. c. aquaticus.
6, 6a. O. gatunensis.
7, 7a. O. cozumelæ.
8, 8a. O. peninsulæ.



SKULLS OF ORYZOMYS.

1, 1a. O. nelsoni.
2, 2a. O. m. melanotis.
3, 3a. O. m. colimensis.
4, 4a. O. r. rostratus.
5, 5a. O. r. megadon.
6, 6a. O. r. yucatanensis.
7, 7a. O. b. bombycinus.
8, 8a. O. b. alleni.

PLATE II.

[All subgenus *Oryzomys* Natural size; all in U. S. Nat. Mus., Biological Survey collection, except figs. 8, 8*a*.]

FIGS. 1, 1*a*. *Oryzomys nelsoni* Merriam. Type. Maria Madre Island, Mexico. ♂ adult. (No. 89200.)

2, 2*a*. *Oryzomys melanotis melanotis* Thomas. Topotype. San Sebastian, Jalisco. ♂ adult. (No. 88062.)

3, 3*a*. *Oryzomys melanotis colimensis*, subsp. nov. Type. Armeria, Colima. ♀ adult. (No. $\frac{33289}{45317}$.)

4, 4*a*. *Oryzomys rostratus rostratus* Merriam. Type. Metlatloyuca, Puebla. ♀ adult. (No. 93112.)

5, 5*a*. *Oryzomys rostratus megadon* Merriam. Type. Teapa, Tabasco. ♂ adult. (No. 99978.)

6, 6*a*. *Oryzomys rostratus yucatanensis* Merriam. Type. Chichen Itza, Yucatan. ♂ adult. (No. 108139.)

7, 7*a*. *Oryzomys bombycinus bombycinus* Goldman. Topotype. Cerro Azul, Panama. ♀ adult. (No. 171103.)

8, 8*a*. *Oryzomys bombycinus alleni* Goldman. Type. Tuis, Costa Rica. ♂ subadult. (No. $\frac{9631}{7971}$, Amer. Mus. Nat. Hist.)

PLATE III.

[All subgenus *Oryzomys*. Natural size; all in U. S. Nat. Mus., Biological Survey collection.

FIGS. 1, 1*a*. *Oryzomys alfaroi alfaroi* (Allen). Yaruca, Honduras. ♀ adult. (No. 131817.)

2, 2*a*. *Oryzomys alfaroi dariensis* Goldman. Type. Cana, Panama. ♀ adult. (No. 178660.)

3, 3*a*. *Oryzomys alfaroi rhabdops* Merriam. Type. Calel, Guatemala. ♂ adult. (No. 76813.)

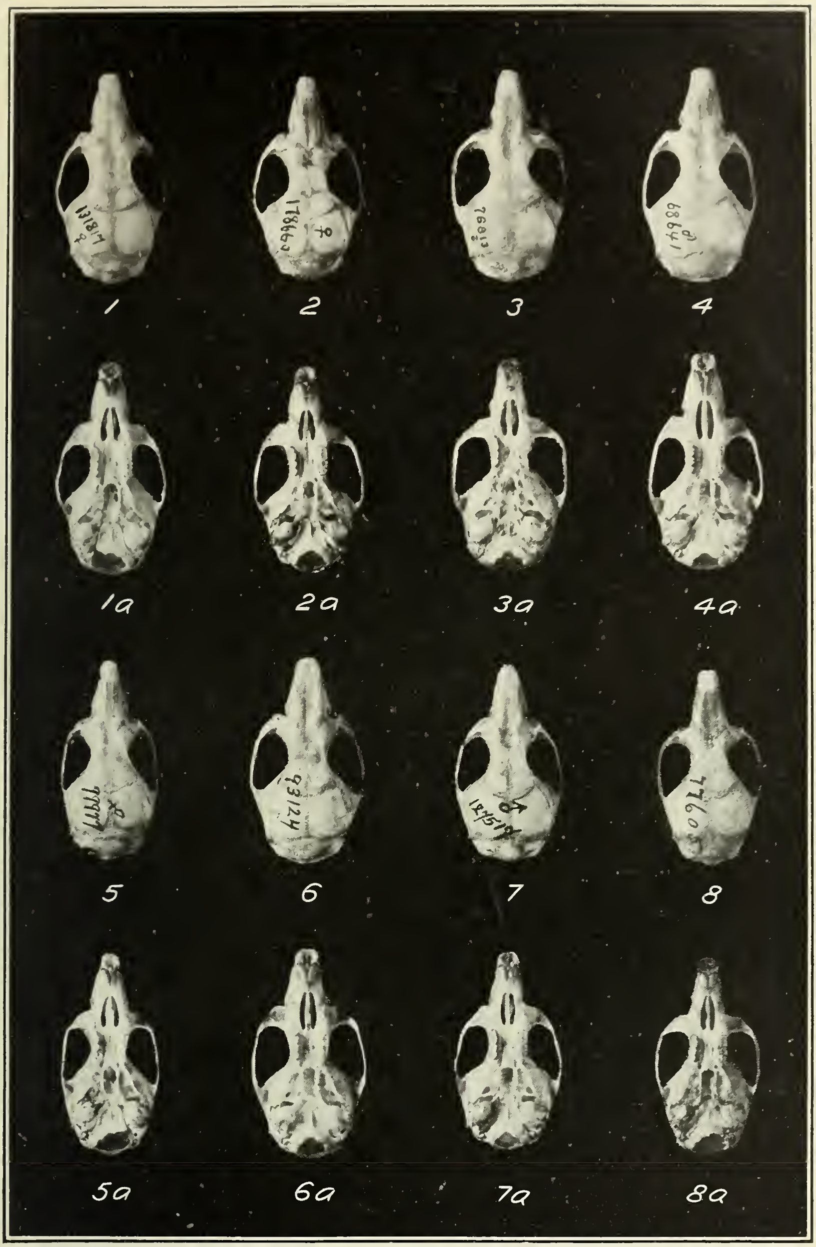
4, 4*a*. *Oryzomys alfaroi caudatus* Merriam. Type. Comaltepec, Oaxaca. ♂ adult. (No. 68641.)

5, 5*a*. *Oryzomys alfaroi palatinus* Merriam. Type. Teapa, Tabasco. ♀ adult. (No. 99977.)

6, 6*a*. *Oryzomys alfaroi dilutior* Merriam. Type. Huauchinango, Puebla. ♂ adult. (No. 93124.)

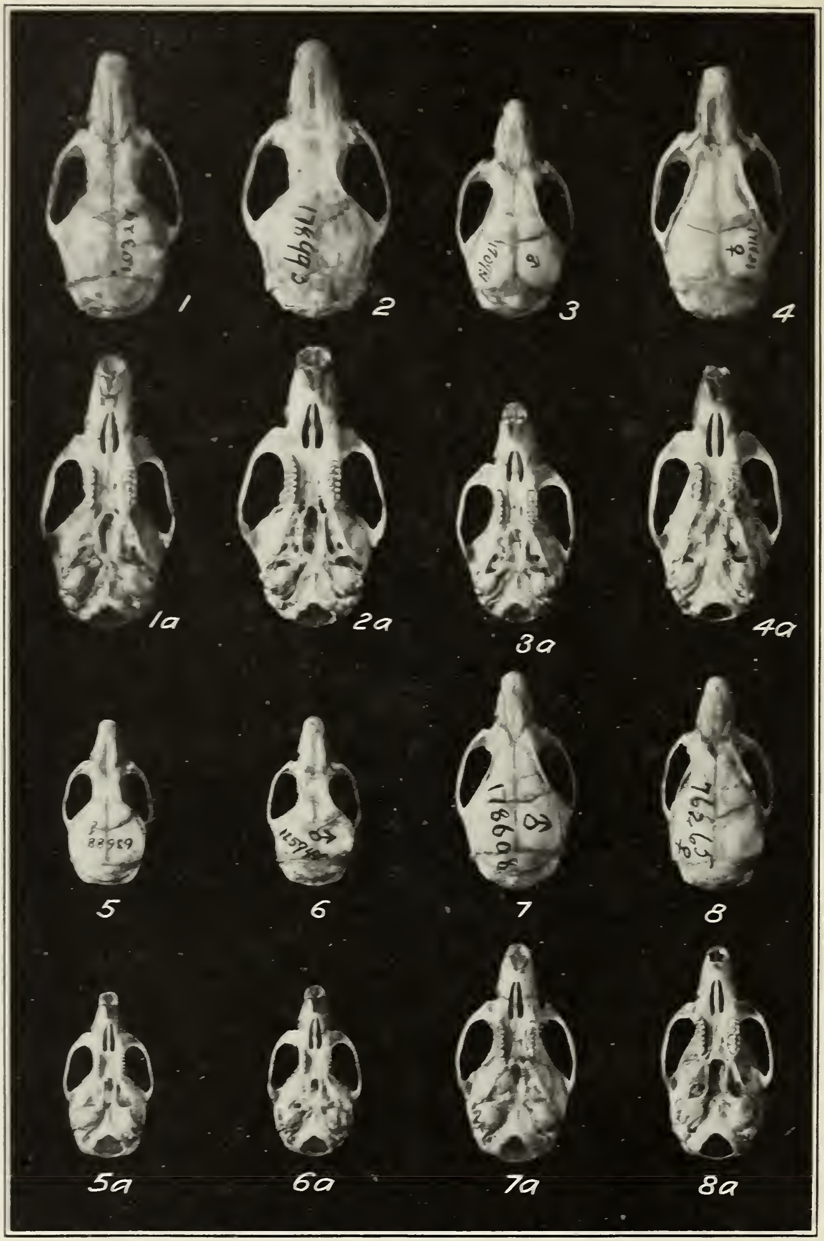
7, 7*a*. *Oryzomys guerrerensis* Goldman. Type. Omilteme, Guerrero. ♂ adult. (No. 127517.)

8, 8*a*. *Oryzomys hylocetes* Merriam. Type. Chicharras, Chiapas. ♂ adult. (No. 77605.)



SKULLS OF ORYZOMYS.

1, 1a. O. a. alfaroi.
2, 2a. O. a. dariensis.
3, 3a. O. a. rhabdops.
4, 4a. O. a. caudatus.
5, 5a. O. a. palatinus.
6, 6a. O. a. dilutior.
7, 7a. O. guerrerensis.
8, 8a. O. hylocetes.



SKULLS OF ORYZOMYS.

1, 1a. O. devius.
2, 2a. O. pirrensis.
3, 3a. O. talamancæ.
4, 4a. O. t. frontalis.
5, 5a. O. f. fulvescens.
6, 6a. O. f. lenis.
7, 7a. O. c. idoneus.
8, 8a. O. c. chrysomelas.

PLATE IV.

[Natural size; all in U. S. Nat Mus., Biological Survey collection, except figs. 1, 1*a*.]

FIGS. 1, 1*a*. *Oryzomys* (*Oryzomys*) *devius* Bangs. Type. Boquete, Panama. ♀ adult. (No. 10324, Mus. Comp. Zool.)

2, 2*a*. *Oryzomys* (*Oryzomys*) *pirrensis* Goldman. Type. Mount Pirre, Panama. ♂ adult. (No. 178993.)

3, 3*a*. *Oryzomys* (*Oryzomys*) *talamancæ* Allen. Gatun, Canal Zone. ♂ adult. (No. 170981.)

4, 4*a*. *Oryzomys* (*Oryzomys*) *tectus frontalis* Goldman. Type. Corozal, Canal Zone. ♀ adult. (No. 171531.)

5, 5*a*. *Oryzomys* (*Oligoryzomys*) *fulvescens fulvescens* (Saussure). Orizaba, Vera Cruz. ♂ adult. (No. 63688.)

6, 6*a*. *Oryzomys* (*Oligoryzomys*) *fulvescens lenis* Goldman. Type. Los Reyes, Michoacan. (No. 125941.)

7, 7*a*. *Oryzomys* (*Oligoryzomys*) *caliginosus idoneus* Goldman. Cana, Panama. ♂ adult. (No. 178608.)

8, 8*a*. *Oryzomys* (*Oligoryzomys*) *caliginosus chrysomelas* (Allen). Port Limon, Costa Rica. ♂ adult. (No. 76265.)

Plate V.

[Natural size; all in U. S. Nat. Mus., Biological Survey collection.]

Fig. 1. *Oryzomys* (*Oryzomys*) *palustris palustris* (Harlan). Georgetown, South Carolina. ♂ adult. (No. 71367.)

2. *Oryzomys* (*Oligoryzomys*) *fulvescens fulvescens* (Saussure). Orizaba, Vera Cruz. ♂ adult. (No. 58248.)

3. *Oryzomys* (*Melanomys*) *caliginosus idoneus* Goldman. Cana, Panama. ♂ adult. (No. 178663.)

4. *Oryzomys* (*Oryzomys*) *palustris palustris* (Harlan). Greenwich, New Jersey. ♂ adult. (No. 117384.)

5. *Oryzomys* (*Oryzomys*) *melanotis melanotis* Thomas. San Sebastian, Jalisco. ♂ adult. (No. 88061.)

6. *Oryzomys* (*Oryzomys*) *alfaroi dariensis* Goldman. Cana, Panama. ♂ adult. (No. 178657.)

7. *Oryzomys* (*Oryzomys*) *talamancæ* Allen. Gatun, Canal Zone. ♀ adult. (No. 170979.)

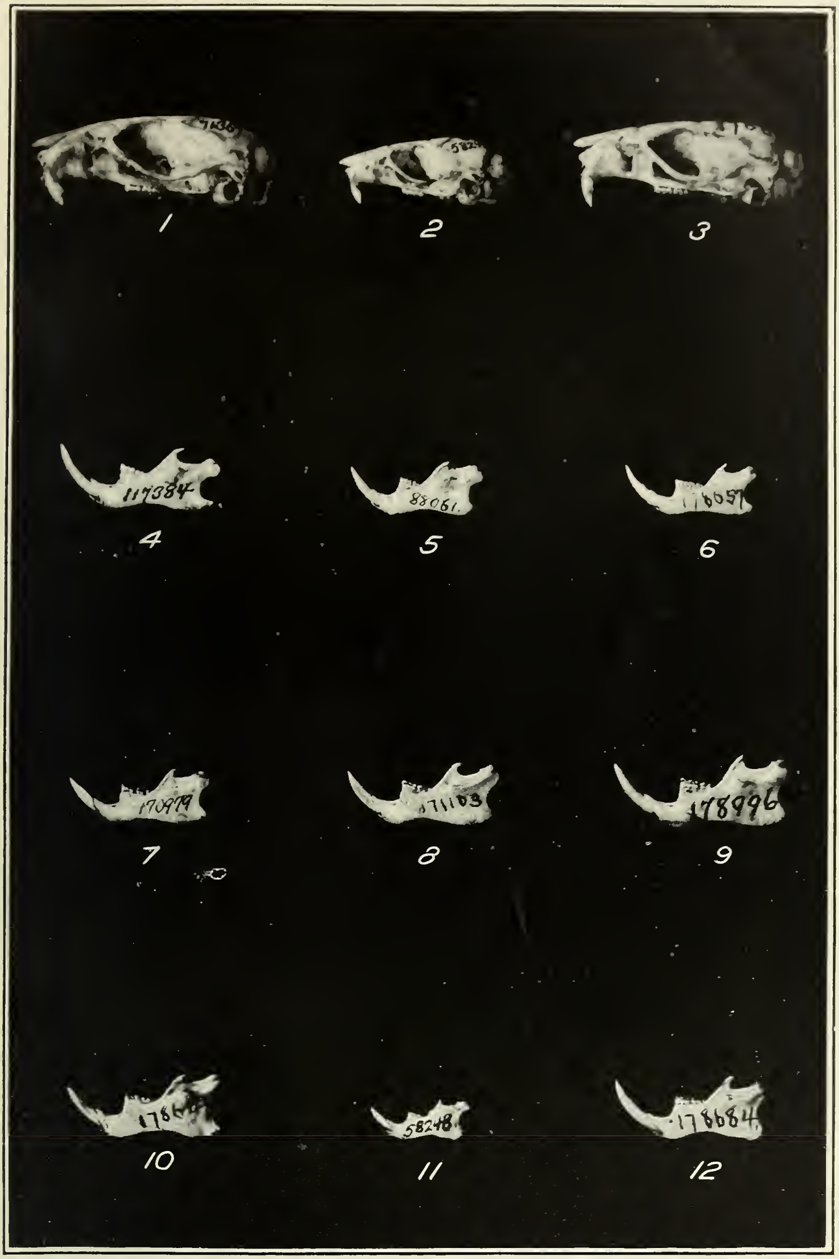
8. *Oryzomys* (*Oryzomys*) *bombycinus bombycinus* Goldman. Cerro Azul, Panama ♀ adult. (No. 171103.)

9. *Oryzomys* (*Oryzomys*) *pirrensis* Goldman. Mount Pirre, Panama. ♂ adult. (No. 178996.)

10. *Oryzomys* (*Oryzomys*) *tectus frontalis* Goldman. Cana, Panama. ♂ adult. (No. 178649.)

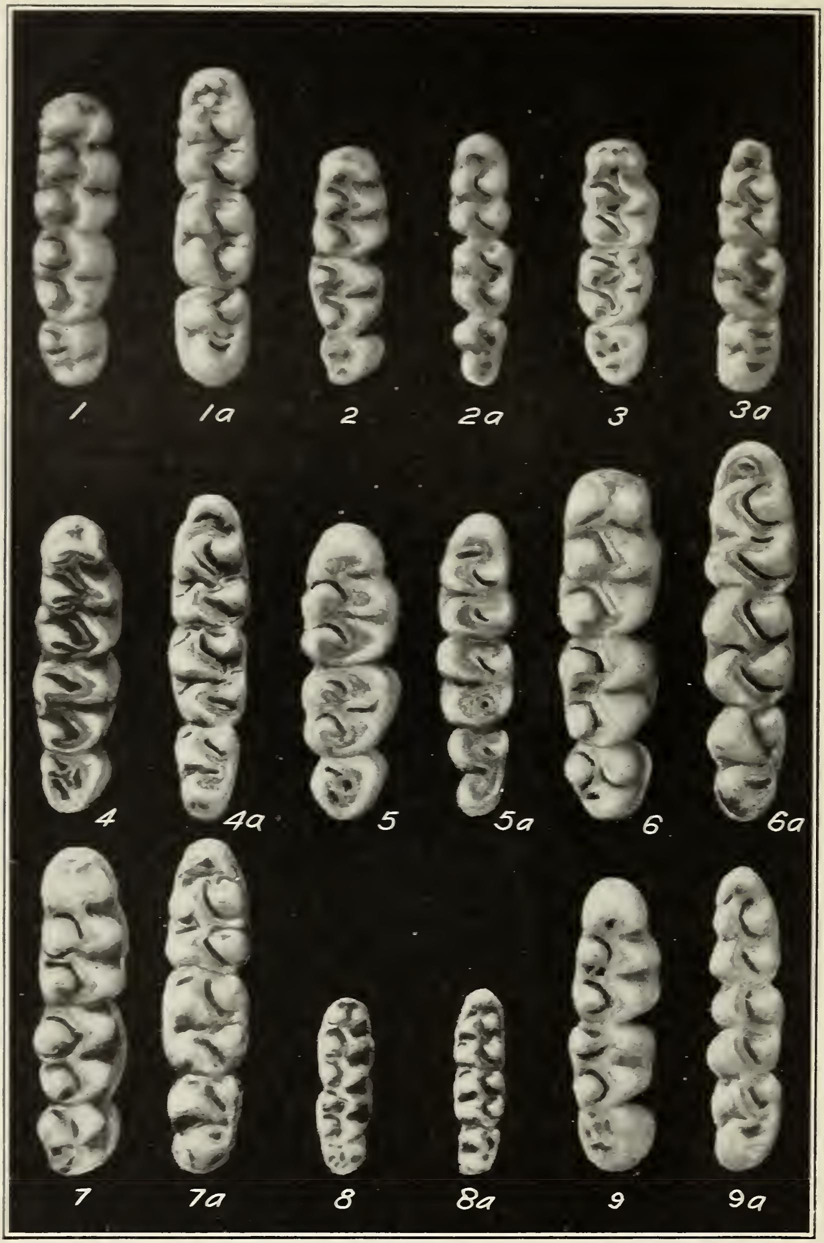
11. *Oryzomys* (*Oligoryzomys*) *fulvescens fulvescens* (Saussure). Orizaba, Vera Cruz. ♂ adult. (No. 58248.)

12. *Oryzomys* (*Melanomys*) *caliginosus idoneus* Goldman. Cana, Panama. ♂ adult. (No. 178684.)



SKULLS AND MANDIBLES OF ORYZOMYS.

1, 4. O. p. palustris.
2, 11. O. f. fulvescens.
3, 12. O. c. idoneus.
5. O. m. melanotis.
6. O. a. dariensis.
7. O. talamancæ.
8. O. b. bombycinus.
9. O. pirrensis.
10. O. t. frontalis.



MOLARS OF ORYZOMYS.

1, 1a. O. p. palustris.
2, 2a. O. m. melanotis.
3, 3a. O. a. dariensis.
4, 4a. O. talamancæ.
5, 5a. O. b. bombycinus.
6, 6a. O. pirrensis.
7, 7a. O. t. frontalis.
8, 8a. O. f. fulvescens.
9, 9a. O. c. idoneus.

Plate VI.

Slightly retouched and enlarged about eight diameters; all in U. S. Nat. Mus., Biological Survey collection.]

Figs. 1, 1*a*. *Oryzomys* (*Oryzomys*) *palustris palustris* (Harlan). Dismal Swamp, Virginia. ♂ subadult. (No. 75203.)

2, 2*a*. *Oryzomys* (*Oryzomys*) *melanotis melanotis* Thomas. Ixtapa, Jalisco. ♂ subadult. (No. 88068.)

3, 3*a*. *Oryzomys* (*Oryzomys*) *alfaroi dariensis* Goldman. Cana, Panama. ♂ subadult. (No. 178653.)

4, 4*a*. *Oryzomys* (*Oryzomys*) *talamancæ* Allen. Cana, Panama. ♀ subadult. (No. 179601.)

5, 5*a*. *Oryzomys* (*Oryzomys*) *bombycinus bombycinus* Goldman. Cerro Azul, Panama. ♀ adult. (No. 171103.)

6, 6*a*. *Oryzomys* (*Oryzomys*) *pirrensis* Goldman. Mount Pirre, Panama. ♀ subadult. (No. 179030.)

7, 7*a*. *Oryzomys* (*Oryzomys*) *tectus frontalis* Goldman. Cana, Panama. ♀ subadult. (No. 178646.)

8, 8*a*. *Oryzomys* (*Oligoryzomys*) *fulvescens fulvescens* (Saussure). Orizaba, Vera Cruz. ♂ subadult. (No. 58244.)

9, 9*a*. *Oryzomys* (*Melanomys*) *caliginosus idoneus* Goldman. Cana, Panama. ♀ subadult. (No. 178668.)

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[New names in **bold-faced type;** synonyms in *italics;* principal references in **bold-faced figures.**]

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